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- Create Your Virtual Office with Teamware
- Baby Boom: Top-Rated Software for Toddlers
- Machrone: Computing's Less than Human Touch

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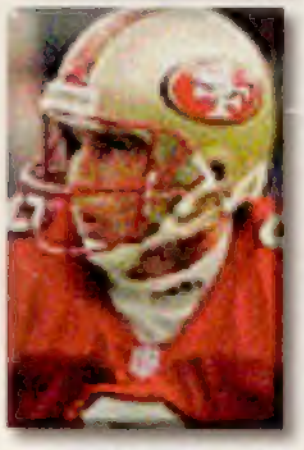

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Whither Windows 98?

A Federal court ruled recently that Microsoft can no longer force PC makers to include Internet Explorer 4.0 along with Windows 95. As I write this, it's not clear whether this will impact Windows 98. But in looking at early versions of the long-awaited operating-system upgrade, I find that IE is important, although the OS also has a lot of new features that don't depend on the browser.

For a long time, Microsoft has been pushing the complete integration of IE as the major feature of Win 98. (See "Memphis & IE 4.0," September 9, 1997, and "Face-Off," November 18, 1997.) IE4 provides a fair amount of integration, letting you see the files on your hard disk or your network within a browser window, looking just like Web sites. It also includes the option of setting an Active Desktop that receives various entertainment and information channels as well as push content. All these things are in Win 98 but aren't very different from IE itself. The judge cited this in explaining why he thought Win 95 and IE were separate products.

Because IE4 is available separately as a free upgrade to Windows 95, Microsoft has been honing its message that there are other things in Win 98 for making it a compelling upgrade. Yet this takes on a new urgency now that there's a greater possibility Microsoft won't be able to count on IE's inclusion in Win 98.

First off are the new benefits that are most obvious but perhaps most needed. Windows 98 should be more stable, and much more polished, with more drivers. As you would expect, it also contains built-in support for new kinds of hardware that have shipped since Windows 95, such as USB peripherals and DVD drives. Though previous OEM versions of Windows 95 supported the FAT32 disk format—and thus, larger disk partitions—this is the first version that lets you convert old disks to the new format.

Windows 98 also speeds up performance, and that is another win for everyone. One significant change is a Tune-Up Wizard that can monitor your disk, defragment it, and change where applications physically reside so they load faster. The OS will also manage memory better so it has to swap to disk less frequently.

I'm more intrigued by some of the ways Microsoft is trying to make the operating system easier to set up, use, and maintain, because when I talk to users they tell me these are the things that really take time and effort.

Some of the features include a new way for corporate users to create install files for Windows and associated drivers. In Windows 98, a new image-preparation tool lets an IT shop install and configure the OS and all applications on one machine, back them up, and then copy the image to a destination machine. It's a step in the right direction.

Still, I'd like more. I'd like to see an option for those who maintain multiple machines or who set up new ones without a network. I'd like to take all of my Windows settings (such as icon positions, backgrounds, and screensaver settings) and back them up on a floppy disk in a simple manner. Then I want to install that disk on a new machine and apply my settings.

It would be even better if this also worked for my applications. If you've ever moved to a new machine running Office, you've probably discovered that you needed to go back and set your options for such things as toolbars, format save settings, macros, users, and personal dictionaries. Locating all these settings in Windows and your applications is a nearly impossible job.

Other features include some cosmetic improvements to the user interface, support for multiple monitors, a log-on that works for multiple family members, a better system information utility, an improved back-up-and-restore utility, and a better way of handling updates and uninstalling.

Many of these features are available now in third-party utilities, which raises a new question: Should Microsoft be allowed to incorporate *them* in the base OS?

MICHAEL J. MILLER

PHOTOGRAPH BY SHONNA VALESKA

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COVER STORY

THE TOP 100 WEB SITES

BY TRACY KERIEVSKY

The Web is still lots of fun to explore, but fortunately, it's quickly becoming a lot more useful, too. Our latest list of the Web's best locations focuses on sites that help you find information you need or help you get things done with a minimum of mouse clicks 100

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COVER: DIGITAL IMAGING BY JOE SKI/VISUAL LOGIC; PHOTOGRAPHS (TOP) THOM O'CONNOR

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Digital Camera Output

The digital cameras we've evaluated in this issue are good, but are they good enough for you? Join us online and see for yourself as we present output samples from all the cameras.

Also online: Links to the Top 100

Web Sites featured in this issue's cover story are available at one central location. Come along on a tour.

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NETWORKING: TEAMWARE

Instant Groupware

BY GREG ALWANG

Could your business use a centralized electronic meeting place where team members review project plans, check on deadlines, and both receive and leave e-mail messages for other team members? But you say you're not big enough to justify a major groupware installation? And besides, you don't have an IS department to maintain a groupware installation anyway? Then one of these seven new *teamware* or *virtual-office* packages may be right for you. But since each package defines *teamware* a little differently, check out the products in our roundup to find the one that best fits your needs 175

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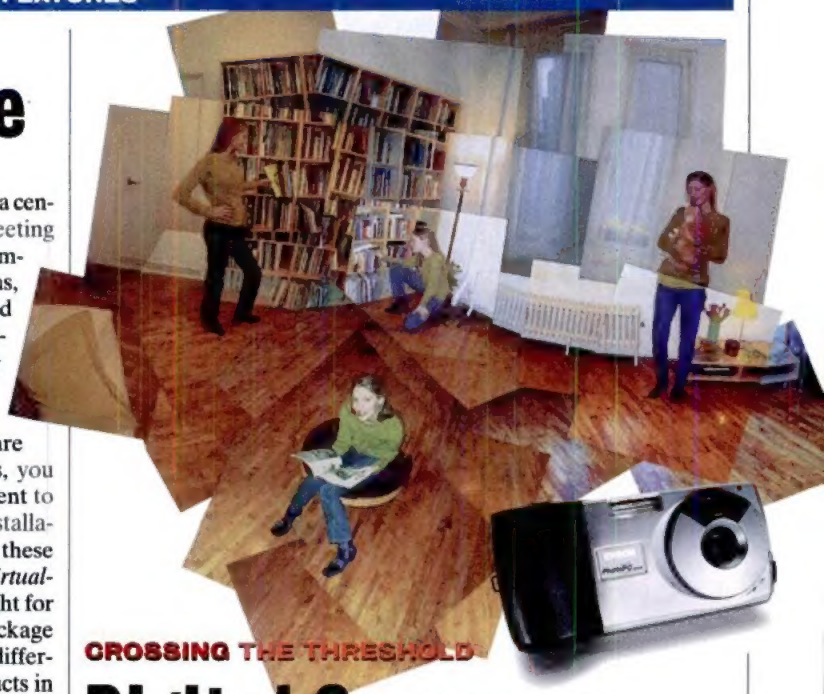

CROSSING THE THRESHOLD

Digital Cameras

BY DANIEL GROTTA AND SALLY WIENER GROTTA

Poised to be the next de rigueur PC peripheral, digital cameras deliver reasonable resolution for the immediacy and suitability of the images they produce for the Web. During this boom period in the market, though, we're seeing wild variations in performance, features, and operation. We test 29 digital cameras that offer at least VGA resolution and cost less than $1,000 street 132

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BY TERI ROBINSON

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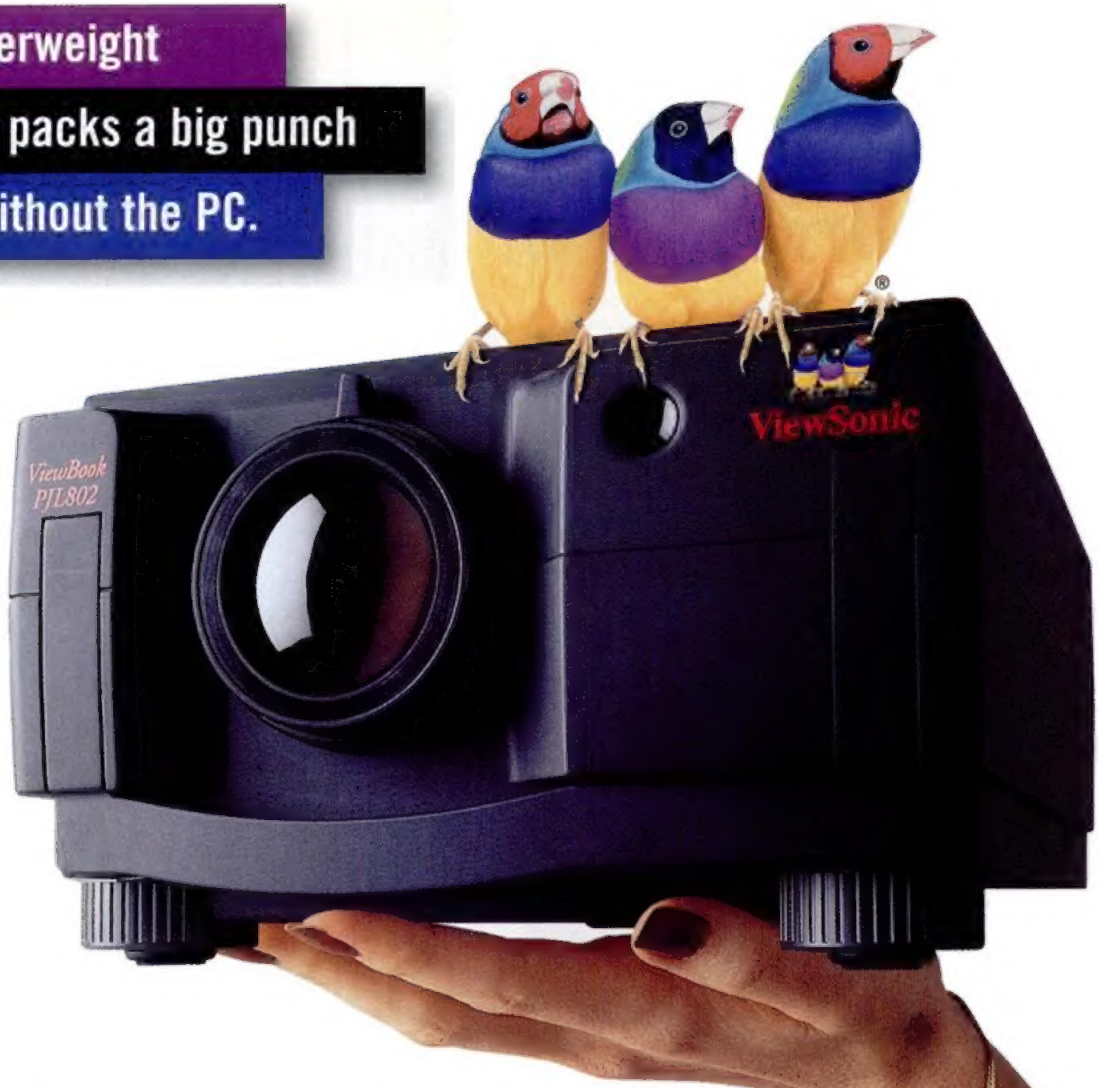

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Pipeline

Intel's Road to Merced

Details of Intel's upcoming processors Deschutes—due in the first quarter of 1998—and Merced—due in 1999—have already become public. Now some of the company's interim processor plans for 1998 are coming into clearer focus as well.

At this year's Microprocessor Forum, the IA-64 chip Merced drew much discussion for its new instruction-set architecture, designed to leapfrog those of current RISC processors. Both Merced and the next-generation IA-32 chip Willamette aren't due until 1999, though.

By the end of 1998, Intel plans to introduce a new Pentium II design—code-named Katmai—that will add a set of enhanced instructions to the existing MMX multimedia instructions, as well as a new core-logic chip set designed to boost Pentium II speeds to 450 MHz.

The moves leading up to Merced fall in line with what Robert Colwell, Intel's director of IA-32 architecture, calls a strategy of "shooting high enough so we can then propagate downward into market segments."

Katmai will be based on the P6 architecture, which began with the Pentium Pro. Like Deschutes, the chip will be built on Intel's 0.25-micron process. (Merced will be based on a new 0.18-micron process.) Katmai will incorporate efficiency enhancements to the current MMX multimedia instruction set. The Katmai processors will be available in several flavors, including a chip with 512K of Level 2 cache on-board.

Willamette, which is due out in 1999, will add more efficiency enhancements. Specifics on clock speeds and other features for Katmai, Willamette, and Merced aren't out yet, but the Pentium II will see significant clock speed increases throughout 1998.

Intel's processor moves come at a time when analysts are predicting a boom in the semiconductor market. According to a recent report from the Semiconductor Industry Association, the industry will see double-digit growth until 2000.

ILLUSTRATION BY HARRY CAMPBELL

"A parent's right to block offensive speech is as fully protected by the First Amendment as the right to issue that speech."

—Vice President **Al Gore,** *speaking at the recent Internet Online Summit: Focus on Children.*

Feel Your Software

Imagine trying to turn a page in a book without being able to feel it. You'd have to move your eyes from the words, focus your full visual attention on the page corner, and then carefully position your hand—by eye alone—to turn the page. Up until now, that's what it's been like to use your computer's mouse.

The FEELit Mouse, from Immersion Corp.—which is due for release in mid- to late 1998—will change all this. The mouse is permanently mounted on a pad that houses a processor for generating real-time simulations. An electromagnetic drive inside the pad generates the sensations that you experience.

You actually feel the three-dimensional icons that are on a graphical desktop, such as the buttons and window edges. A window edge or scroll bar feels like a groove into which your cursor "falls," making aiming much quicker and easier. The cursor snaps to menu items so that you don't choose the wrong one. "Pressure Clicking" lets you click a button by pushing against the mouse until it provides the sensation of a button click.

Developers will be able to write software programs that will let you feel textures, surfaces, springs, liquids, and vibrations. If you run your cursor over the image of an ice cube, for example, the image will feel slippery.

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New Digicams: Everybody Say Cheese!	How good are the cameras we've evaluated in this issue? Join us online to examine output samples.
Visit the Virtual Labs	Test your own monitor and printer, and help out as PC Labs tests Internet-related products.
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PC Tech Section: Now Online	Get advice, see how our utilities are written, and keep up with the latest programming tricks.
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Pipeline

Flatter Is Better

Microsoft CEO Bill Gates says that "20-inch desktop LCDs are a key technology to watch." Gates' comment coincides with a flood of new flat-panel LCD screens from several companies.

NEC's new 15-inch flat-panel LCD.

NEC Technologies recently showed a new 15-inch active-matrix LCD monitor, and Samsung Semiconductor and Sharp Electronics recently announced plans to produce large LCDs. ADI Systems, Panasonic, Samsung, and others have shown desktop LCDs ranging from 13 to 15 inches.

High price remains the barrier to widespread adoption of flat-panel desktop displays. For example, NEC's 15-inch LCD lists for $2,700, and the company's 20-inch model lists for $8,000. But prices for the smaller displays are expected to fall below $2,000 across the board over the next year.

DisplaySearch, a market research firm, predicts that desktop LCD sales will grow nearly 100 percent annually from now to 2000. Sharp Electronics expects LCDs to grow to 15 percent of the desktop monitor market by then.

Extranet Rush

Intranets are here, but 1998 is likely to mark the arrival of corporate extranets, which are designed to extend intranets out to customers and business-to-business communications.

To bolster its efforts in the extranet arena, Netscape has announced its intention to acquire Kiva Software, a developer of application server software. According to Netscape CEO Jim Barksdale, "Kiva provides an important strategic technology for linking people and businesses together through extranets." At Netscape's recent Strategy Day, Barksdale characterized extranets as "the next step for the Internet."

Kiva's application server acts as a middleman between standard server software and external Java clients. A customer who wants to access a back-end database at a large enterprise could do so from a Java client through Kiva's application server. According to Netscape vice president John Paul, Netscape sees application servers becoming a $400 million business by the year 2000, as extranets take off. Netscape won't be without competition, though.

Increasingly, Oracle is focused on extending intranets. The company has announced several Java-based applications for enterprises and a new version of Oracle Applications. IBM, Lotus, and Microsoft are also eager to extend corporate intranets out to customers and business-to-business applications. IBM, in particular, is establishing such links within the financial services industry.

ILLUSTRATION BY CHRIS LENSCH

THIS ISSUE'S CONTRIBUTORS: *Sheryl Canter, Angela Hickman, Carol Levin, Sebastian Rupley, and Don Willmott.*

Power to the Publisher

Newspaper publishers are still experimenting with ways to turn electronic news delivery into a money-making proposition. One of the newest strategies turns out to be a return to the old, with an Internet twist.

Zebra Pushware Solutions, based in Jerusalem, has developed an application—called InfoPager—that newspapers can use to deliver customized news over the Internet to an InfoPager viewer on subscribers' desktops. Unlike a Web document, an InfoPager document can retain the look and feel of an actual newspaper, complete with headlines and columns.

An InfoPager server at the newspaper can automatically deliver up to 30 pages of raw text and photographs in about 5 minutes, according to the company. Subscribers can read their

papers off-line, print them out, or read them in Web browsers.

InfoPager also downloads advertisements, which can include graphics, animation, and sound. The advantage for publishers, says CEO Drew Tick, is access to a detailed database of subscribers' news preferences and demographic information, which they can use for targeted advertising. Subscribers, meanwhile, don't get stuck in the "worldwide wait" just to read the daily news.

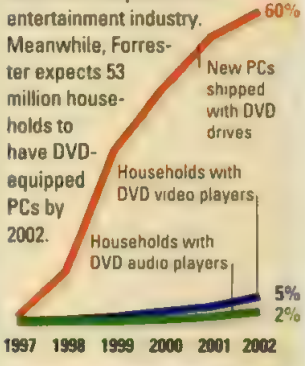
Top-Selling Notebooks

1. IBM ThinkPad 560 133 ($1,248)
2. Compaq Presario 1210 150 ($1,969)
3. Toshiba Satellite Pro 445CDX 133MMX ($1,949)
4. Toshiba Tecra 510CDT 133 ($2,484)
5. Toshiba Satellite Pro 440CDX 133MMX ($1,950)
6. CTX EZBook 750CS 150 ($1,364)
7. Compaq Presario 1610 150MMX ($2,601)
8. Compaq Presario 1620 166MMX ($2,930)
9. Compaq Armada 1530DM 133MMX ($1,943)
10. Acer AcerNote 383 150MMX ($1,700)

Source: PC Data. Data for October; retail sales

DVD: Success and Struggle

DVD—the successor to VHS tape, CD, and CD-ROM—is expected to struggle in the video and music industries but win big in the PC industry. According to Forrester Research, the dearth of movie titles and the high price tags will hold back adoption in the entertainment industry. Meanwhile, Forrester expects 53 million households to have DVD-equipped PCs by 2002.



Source: Forrester Research.

The Connected School

The Internet's impact on education in the United States was the most hotly debated topic at last year's exclusive PC Forum. Now Vice President Al Gore has announced that $425 million in grants will go to the 50 states to get teachers and students on the Internet.

The money will be deployed both to bring Internet-connected computers into schools and to support training for teachers and students.

"We can use technology as a powerful tool to help teach our children what they need to know to compete in the 21st century," Gore said.

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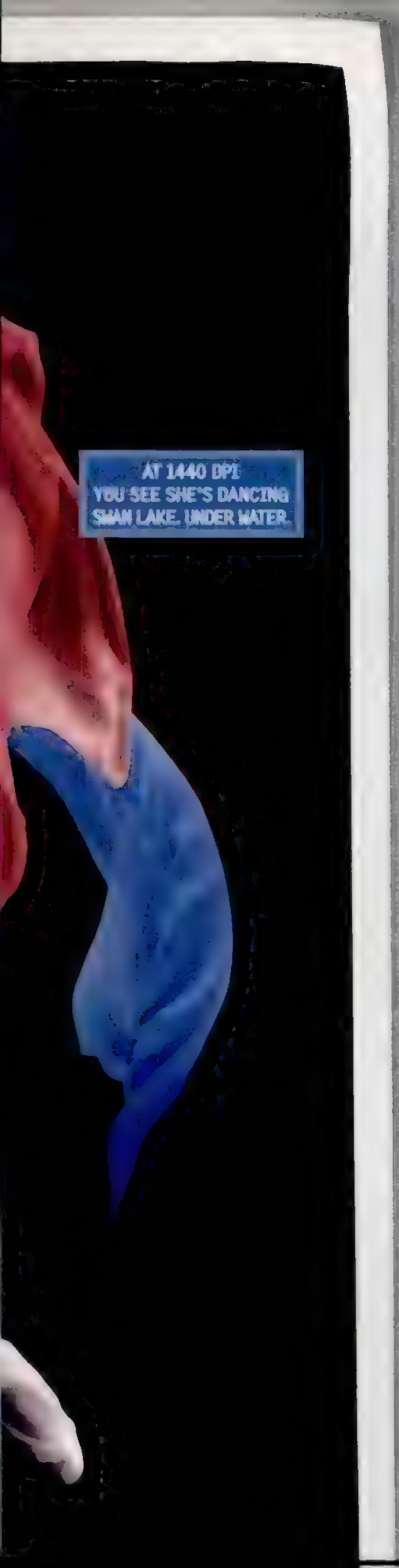

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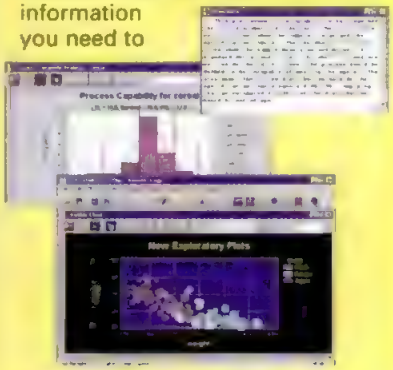

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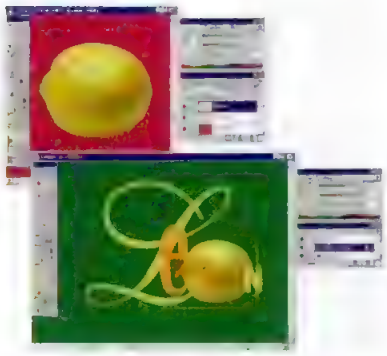

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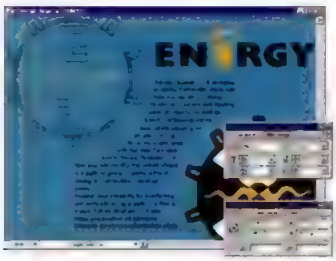

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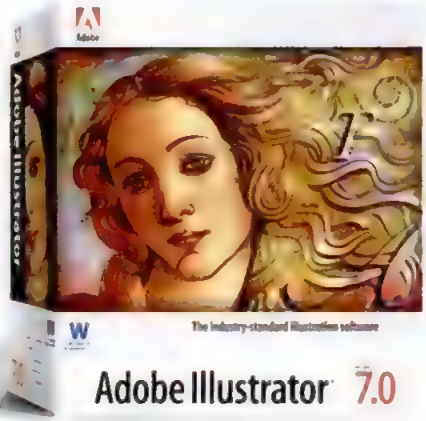

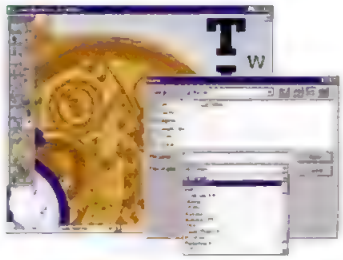

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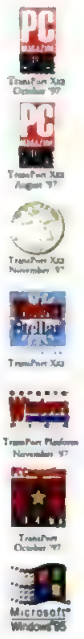

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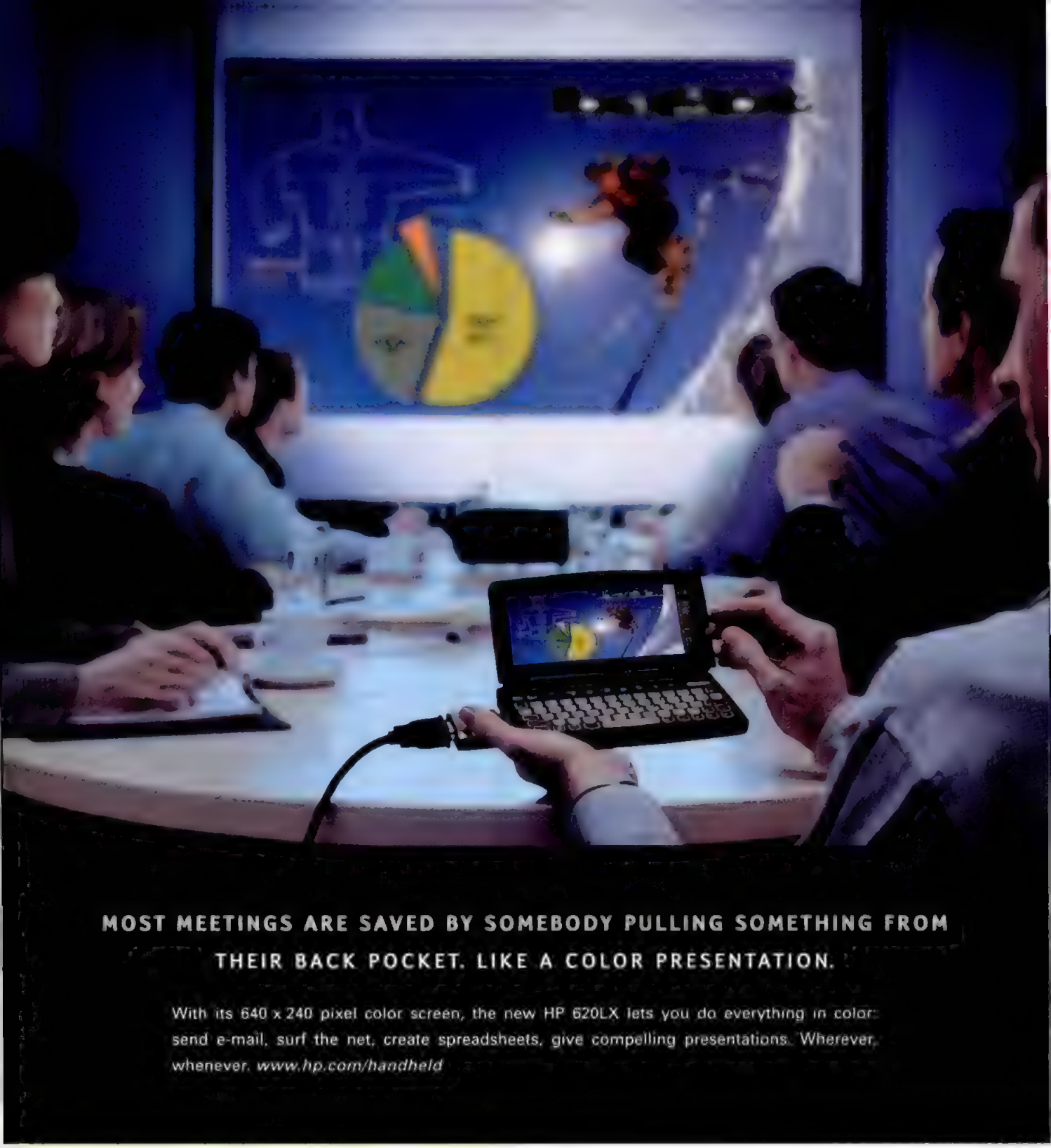

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Letters

SLOTTING AND AGP

I was surprised that you gave an Editors' Choice for professional PCs ("The Best PCs for '97 & '98," December 2, 1997) to two computers that each have only two ISA slots. And on the Dell Dimension XPS D266, neither of the two slots is even available. How am I supposed to use my SCSI HP ScanJet, not to mention other peripherals? These are not PCs for the professional. Aren't you sending the wrong message to vendors?

MIKE BERG
Portland, Oregon

You state, "Though 13 of the professional PCs reviewed here include AGP cards, only 2 implement AGP correctly." Unless I misunderstood the article, merely correcting the software and driver load on the other 11 machines should allow full AGP implementation. Although I applaud your decision to rate the machines on performance with configurations "as delivered" by the suppliers, wouldn't it be of value to your readers at least to indicate the possible graphics performances of the other machines? Would they still be poorer, or would they be on a par with the Dell PC? The article leaves the reader with a distinct impression that only the Dell XPS D266 can perform main-memory texture mapping, and if you buy another machine, you will forever lament your inability to use this key feature of AGP graphics, though in reality all that is needed is a software upgrade.

RICHARD REMSKI
Fort Worth, Texas

Given our time constraints, we were not able to run additional tests. Mr. Remski is correct in stating that AGP-capable systems with true AGP graphics cards would be able to take full advantage of AGP with the software upgrade. The caveat is that some cards claiming to be AGP do not come with all of the hardware necessary to take complete advantage of AGP's features.—Ed.

Your review of PCs provided me with a great deal of useful information. I'm very close to purchasing a new PC and have always found your reviews the most in-depth and trustworthy for such purposes. In the article, you mention that there are "three key pieces of software" necessary for AGP to benefit from a direct path to main memory, one of which is Windows 95 OSR 2.1. You go on to state that of all the PCs with AGP tested, five shipped with OSR 2.0 instead of 2.1. Unfortunately, you do not state which systems dropped the ball on this little detail.

STEVE ANKER
Denton, Texas

"Miller is correct: No single OS will ever be the only one available."

PLATFORM POWER

In his column "A Hill of Beans" (December 2), Michael J. Miller states that "the reality is that there will always be multiple platforms, because different platforms have different strengths."

The PC platform is predominantly based on either Microsoft Windows 95 or Windows NT. This is quite a change from five years ago, when you could get DOS, Windows, OS/2, and others. The fact is that Microsoft, a software vendor, is now setting the terms for hardware vendors, and we are ending up with Windows-specific machines. IBM could have built OS/2-specific machines, much as Apple builds Mac OS–specific machines. I am actually looking forward to the outcome of the Sun versus Microsoft case.

From where I stand, I see little choice in the PC platform. If I want to stay with the PC platform, my only choice is Windows 95, which would not be my first choice.

KEN CAVALIERE-KLICK
Astoria, New York

I agree somewhat with Miller's statements about Sun compromising with Microsoft. Yes, a compromise would be beneficial to the programmers, but is it really fair to Sun? Miller is correct in saying that no single OS will ever be the only one available. There will always be some commercial or underground OS roaming around. The Web browser market is a good example. Netscape started off being the only dude in town. Before long, many companies were releasing their own versions of Web browsers.

RICKY HARDT
via the Internet

EIFFEL NOT JUST IN PARIS

John C. Dvorak's column "Eiffel and the Attack on Java" (December 2) is interesting, but he fails to realize that marketing is and will continue to be a major factor in determining what developers use. Better tools than Microsoft's and better languages than Java have existed and will continue to be created. Developers either simply never find out about them or are skeptical about them. For programmers, the question remains as to whether learning a language will help them get a job. Articles like this are a great service to the programmers' community. They raise awareness of alternatives that have been around but, without proper marketing, have gone unnoticed by the software development community.

FRANCISCO REYES
via the Internet

After reading Dvorak's article, I immediately visited ISE's Web site. From a cursory review of Eiffel, I concluded that his comments are right on target. I was particularly impressed with the simplicity of the language and development environment. But there appears to be one key difference relating to the deployment of applications to a platform other than the original development platform. In Java, the premise is "write once and run anywhere." That sounds great, but the recent controversy over the Java standard makes me wonder about Java's longevity. On the other hand, a deployed Eiffel application (according to ISE) must be recompiled on the target platform to achieve the same result as Java. This raises some logistic issues for developers, who often do not have the resources to invest in multiple development environments.

MARK KUHN
Madison, WI

SNAIL MAIL STILL IMPORTANT

I read Dvorak's December 2 Inside Track column and was glad to see his mention of a new company called E-Stamp. But I disagree with his assessment that if you use e-mail, there is no need to purchase postage over the Internet. My wife owns a small business and uses e-mail daily, but it's not a panacea. To stay in business, she has to make money. She has to send an invoice to get paid, and the only acceptable means is through snail mail.

CHRIS LAWSON
via the Internet

SEYMOUR'S BIG TEN

In his November 18 column, "Tips for...umm... Your Friends," Jim Seymour is right on with his Big Ten Tips. Although I have quite a number of years of PC experi-

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Letters

ence and a degree of expertise, I found two or three invaluable new tips. This type of information is not generally available—and is a must for beginners and experts alike. Thanks for keeping the basics alive. Why not make this the first of a feature column?

JOHN B. HAACK
New Berlin, Wisconsin

Seymour's suggestion of keeping programs and data separate on a hard disk is good. Unfortunately, Microsoft has made this increasingly difficult with Windows 95 and Windows NT. Both systems store much data by default in the Windows directory and its subdirectories. To name a few data types, there are IE's Favorites, Outlook's mail files, wallpaper files, various logs, and temporary files. It is a constant battle to keep data out of these directories, and advice on how to avoid this kind of use would be very helpful.

BOB SMITH
via the Internet

TALKING 3-D

I was disappointed in your review of the ASUS 3DexPlorer 3000 AGP card ("New Technology, New Speed," December 2). Since it's the lowest-priced card and has the second-best 3-D scores, how could you not recommend it?

I have been using it on my new machine for some time now, and it does all I require flawlessly. Its 3D WinMark scores blew everything else away. But what really gets me is the implication that 4MB of on-board RAM is too little for users of big monitors. First, I use a ViewSonic 21-inch monitor and have no problems. Second, I believe this statement exposes a lack of technical expertise, as the whole idea behind AGP is the fact that it can go off the board to system RAM and thus does not need more than 4MB on-board.

GREG CANTIN
via the Internet

I just bought a computer, and it comes with the Diamond Viper V330. I've heard so many amazing things about 3Dfx cards and nothing about nVidia. Can I still play 3Dfx-enhanced games? Is 3Dfx the real standard when it comes to 3-D accelerator compatibility? Also confusing is that my computer comes with a games pack that includes "3Dfx-enhanced" editions of games. Is the V330 a 3Dfx card?

ALEX MILLER
via the Internet

The only true "standard" in 3-D games right now is Microsoft's Direct3D API, part of the DirectX API suite. There has been a buzz in the game development community about the speed and features of the 3Dfx Voodoo Rush chip set, especially for titles written to the proprietary 3Dfx API. The Diamond Viper V330 you own is not a 3Dfx card; it uses the nVidia RIVA 128 (the fastest-performing chip set on our Direct3D benchmark tests in our December 2 roundup). The bottom line: Titles that claim to be "3Dfx-enhanced" may show a higher frame rate on a 3Dfx-equipped card, but all titles that are Direct3D-compatible will get a boost from your card.—Ed.

EVALUATING OPENGL EVALUATION

I feel that your September 23 article "The Two Faces of 300 MHz" misinformed readers regarding performance differences of OpenGL graphics acceleration hardware. It is our understanding that the Pro/Engineer test that *PC Magazine* developed was used to test system-level performance, but the wording of the article heavily emphasizes graphics card acceleration. The result is a misrepresentation of the graphics cards' performance.

Although I definitely see the value in system-level benchmark tests, your readers need to understand that measuring the performance of a system is quite different from measuring the performance of a graphics card. When evaluating true graphics card performance, end users need to refer to tests that have been designed specifically for that purpose. Contrary to the results you obtained, on current OpenGL graphics card benchmark tests, Mitsubishi 3DPro has been consistently the highest-performing accelerator for Windows NT systems. I believe that the Pro/Engineer test is not an accurate measurement of OpenGL graphics card acceleration.

The 3-D graphics industry has been asking for a credible application-based OpenGL benchmark test, and the demand continues to increase. We appreciate *PC Magazine*'s attempt to address this issue, and we urge the industry to continue with the pursuit of a refined OpenGL evaluation tool that can become an industry standard.

JOE ESCHBACH
Assistant Vice President
Mitsubishi Electronics America Inc.

NOT EXACTLY

I installed the ExactTime utility, which was featured in the PC Tech/Utilities section of your November 18 issue. I found it amusing that the selection options for the time-of-day service included the "United States Navel Observatory." As far as I know, the U.S. government does not observe belly buttons.

JOHN STRATHMAN
via the Internet

CORRECTIONS AND AMPLIFICATIONS

In "The Best PCs of '97 & '98," our cover story in the December 2 issue, the Business Graphics WinMark 98 score for the high-end HP Kayak XA 6/266 PC Workstation was below average. The two managed corporate Dell OptiPlex systems we tested came with Dell Inspector 4.0.

In the Summary of Features table that accompanied our November 18 article "Open for Business," several features of The Vision Factory's Cat@log Suite 2.0 were listed incorrectly. The $6,500 suite includes the Builder, Manager, Commerce, and Statistics modules, and it runs under Microsoft Windows 95 or Windows NT 4.0, Sun Solaris, HP UX, and SGI Irix. Cat@log Suite 2.0 works with any NSAPI, ISAPI, or CGI Web server, and it includes five storefront templates. The product offers native drivers for Informix, Oracle, and Sybase; it has SQL support and can link with existing accounting systems. It also allows you to maintain customer and inventory databases and to generate invoices. For a complete and accurate listing of the features of Cat@log Suite 2.0, please visit our Web site at *www.pcmag.com*. It should also be noted that the logo for The Vision Factory in our Suitability to Task box was printed incorrectly. Finally, the Summary of Features table incorrectly identified The Internet Factory's Merchant Builder 2.1 as an Editors' Choice recipient. The only recipients of our Editors' Choice in this category were iCat's Electronic Commerce Suite 3.0, Professional Edition, and Viaweb Store 3.0.

In the November 18 article "Let's Go Shopping," we incorrectly stated that customers may order from Amazon.com by telephone. The company has a provision for customers who are uncomfortable with sending credit card numbers online: It lets them phone in the last four digits of a credit card number when ordering electronically. Phone orders, however, are not accepted by Amazon.com.

HOW TO CONTACT US--

We welcome your comments and suggestions. Please send Letters to the Editor via

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Medalist disc drives bring higher performance and reliability to the desktop. Today's PCs have more to save than ever before. Massive multimedia files, Web downloads, graphics, you name it.

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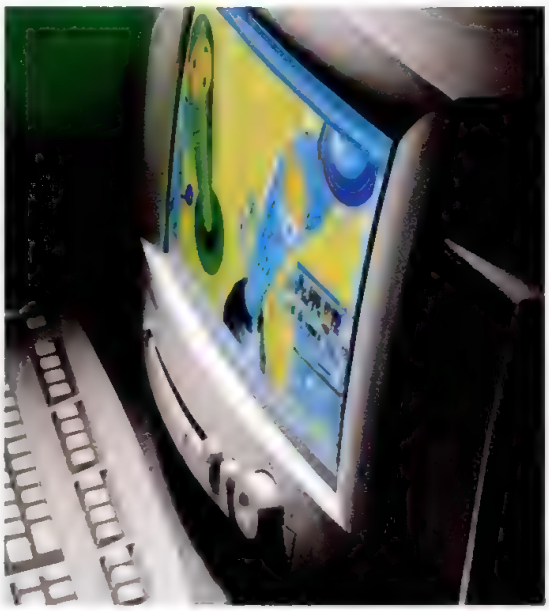

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Avg. Seek	11 msec	9.5 msec	11 msec	12 msec	12 msec	12 msec	12 msec
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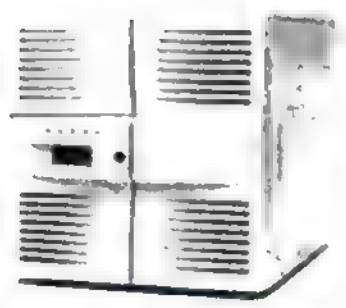

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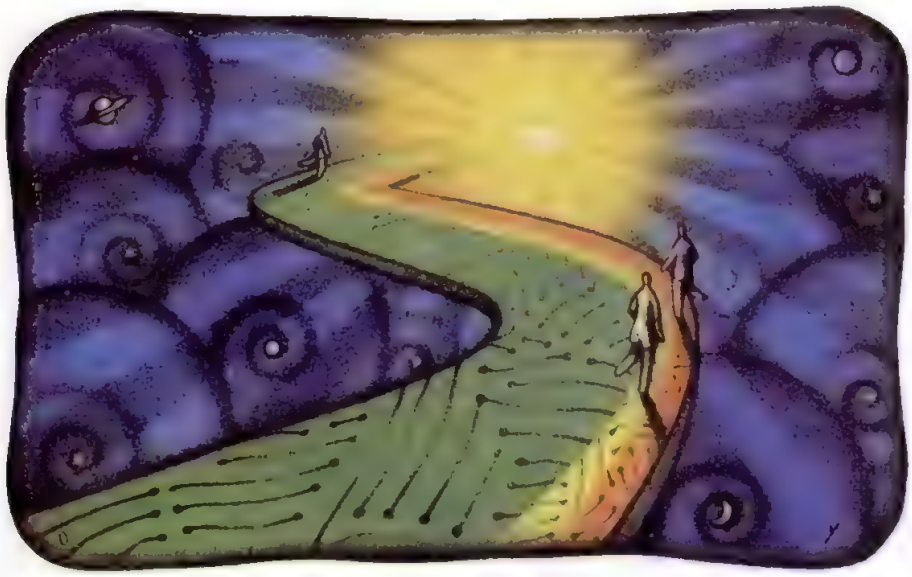


ILLUSTRATION BY TROY THOMAS

Get in the Fast Lane

New DSL technologies promise multimegabit Internet access.

This year has seen the emergence of at least half a dozen new kinds of devices to access the Internet; scores of new tools for creating, posting, and viewing content; and increased demand for Internet-based multimedia. As a result, the need for speedier connections is all the more apparent. At Fall Comdex, both Microsoft chairman Bill Gates and Compaq chief Eckhard Pfeiffer pointed to the newest high-speed technology on the horizon: Digital Subscriber Line (DSL). Both see DSL taking off in the next five to ten years.

The collection of high-speed technologies, known generically as xDSL, promises superfast Internet access—up to 160 times as fast as with 56-Kbps modems, depending on the type of DSL technology. And because DSL works with existing copper telephone wires, it requires less upgrading of telephone companies' networks than some other broadband solutions. That's really good news, according to Gates. He singled out Asymmetric Digital Subscriber Line (ADSL) as more advantageous than many other upcoming bandwidth solutions, because it doesn't require a whole new infrastructure.

Industry analysts agree. "The [DSL] technologies have a tremendous amount of potential," says Lee Doyle, an analyst with market research firm International Data Corp. "Any technology that you can use to speed up Internet access with existing copper wires is good."

BUSINESS FIRST

Whereas cable modems are targeted at consumers, DSL will be more prevalent among businesses—largely because of the high cost, from 50 dollars to several hundred dollars a month. As a result, neither cable modems nor DSL modems are expected to overtake analog modems—cheap by comparison—anytime soon. In fact, neither technology is expected to grab more than 5 percent of the Internet access market in the next five years, says Doyle.

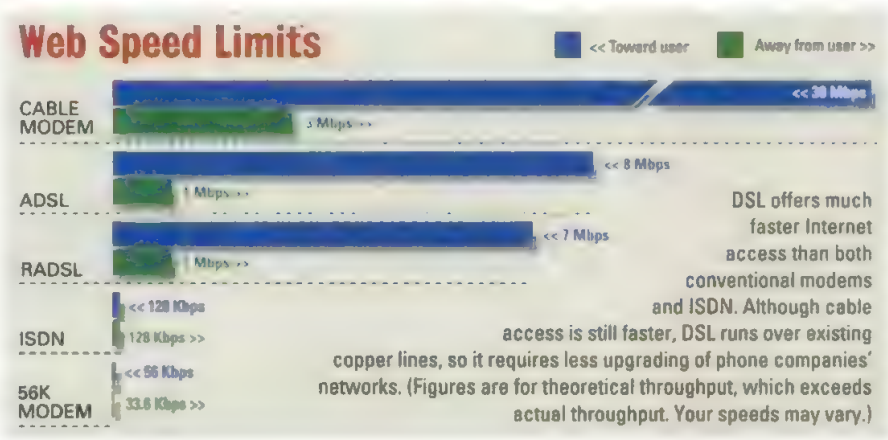
"The most promising flavor of the DSL family is ADSL, because of its effectiveness over long distances," comments Mark Meudt, a spokesperson for DSL equipment maker Westell Technologies. ADSL provides bandwidth downstream of up to 8 Mbps and upstream of up to 1 Mbps. Since ADSL uses a dedicated Internet connection—no dial-up connection is required—subscribers get continuous access.

Like cable modems, ADSL modems lack an industry standard, although several are in the works. Two versions of ADSL are Discrete Multitone (DMT) and Carrierless Amplitude Phase (CAP). Both will become standards, but DMT will be first, says Meudt. Westell plans to have the first DMT modems on the market soon after a standard is reached, hopefully within the next few months.

LIMITED DEPLOYMENT

Limited deployment of DSL is taking place on both coasts. Thorn Communications, an ISP based in New York City, has been offering DSL since the fall. Working with a realty company that owns and manages buildings around the city, Thorn wired several buildings for DSL—specifically Rate Adaptive Digital Subscriber Line (RADSL), a DSL variation that lets a phone company adjust a link's bandwidth according to demand. Thorn charges $400 to $600 per month and offers 2.56-Mbps throughput.

GTE Communications, a unit of GTE Corp., has begun deploying ADSL in California. Its ADSL OnSite services up to 1,000 residential units at Mariners Village, an apartment complex in Marina Del Rey. The complex's telephone equipment room has RADSL modems, an Ethernet switch, and routers to direct data between the Internet (over a T1 line) and subscribers. Each apartment has an ADSL modem.—*Angela Hickman*



Synchronized Surfing

A new standard in the works will bring TV-like content to the Web.

In a move that could portend the much-anticipated convergence of Internet- and television-based content, a new standard in the works promises to extend the Web's multimedia capabilities by delivering "television-like content."

Synchronized Multimedia Integration Language (SMIL) describes a simple markup language that lets developers synchronize content—such as text and voice—without arcane scripting. It would let a developer write commands such as "play audio file A in parallel with video file B" and "show image C after audio file A has finished playing."

"The user experience will be very similar to what people have traditionally described as interactive television," says Philipp Hoschka, chair of the Synchronized Multimedia Working Group of the World Wide Web Consortium (W3C) and editor of the SMIL specification.

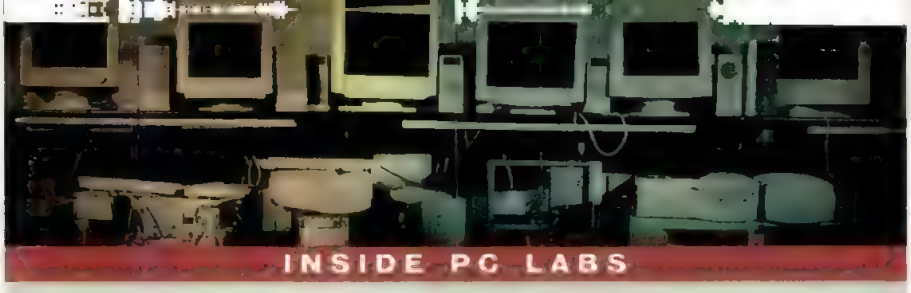
SMIL lets developers create content using low-bandwidth media types, such as text and graphics. The approach is far more efficient than encoding these media types as video and transmitting it over the network. The basic idea is to divide the screen into sections, some filled with low-bandwidth media and some with high-bandwidth media such as video.

Key to SMIL's simplicity is its use of just a few new tags—including "parallel" and "sequential" tags—which describe a document's temporal schedule. For example, to synchronize a sequence of images and audio for a slide show, developers would use a simple editor to enclose both the image sequence and the audio in parallel tags.

SMIL is based on Extensible Markup Language (XML)—a metalanguage based on SGML, on which HTML is also built. The W3C is at work on other XML applications as well, including MathML for embedding mathematical expressions in Web documents.

Meanwhile, browser vendors will need to update their wares to support SMIL. SMIL support will probably also be available via plug-ins.—*Angela Hickman*

PHOTOGRAPH BY THOM O'CONNOR; ILLUSTRATION BY BEATA SZPURA



INSIDE PC LABS

ZD Virtual Labs Is at Your Service

REVIEWS, FEATURE INTRODUCTIONS, AND benchmark-test results can tell you a lot about a product or service; but sometimes there's just no substitute for first-hand experience. So now PC Magazine Labs works with our online team on ways to let you test products yourself. Now you don't have to drop in on our main labs in New York City and Foster City, California, to evaluate products hands-on. At the ZD Virtual Labs *(www.virtual-labs.com)*, we've set up servers that can host a variety of products so you can compare them online.

In setting up and testing the Virtual Labs, we made a number of interesting discoveries. Some of them related to building the site itself. Our initial projects required us to run Windows NT on the Virtual Labs servers, even though PC Magazine Online and ZDNet run mostly on Unix-based machines. Some of the capabilities that Webmasters might take for granted with Unix turned out to require workarounds on Windows NT servers, because Windows NT is graphically based.

We also learned a few things about the products we made available for testing. The first project involved testing a "metafinder," which lets you simultaneously query five Internet directories of people's addresses. The metafinder shows you how many matches each service offers for a query; we were surprised by the spotty quality of the results. When we searched on names of our colleagues and acquaintances, we were surprised by how often we got no hits at all. Our informal testing leads us to believe that these services have a long way to go before they become any kind of universal white pages.

When we set up the Virtual Labs to compare streaming-video playback systems, it gave us an opportunity to see how video quality deteriorated as connection speeds decreased. We encoded two video sequences—one a "talking head" with relatively limited motion, the other an action sequence with frequent changes in camera angle—at data rates ranging from 28.8 Kbps to 200 Kbps.

TEST YOUR OWN: *Does your Web browser measure up? Take it through the compatibility test at our new Virtual Labs, located at* www.virtual-labs.com.

If you visit the Virtual Labs on a sufficiently high-speed connection, you can start by viewing a clip encoded at a high data rate, then try successively lower-bandwidth versions in order to see how quality deteriorates. (If you're dialing in on a slow connection, there's no way to simulate the experience you'd get over a faster link.)

In conjunction with our next issue, we'll be offering the opportunity for you to try out various Web discussion packages for yourself. The Virtual Labs also lets you test your own hardware and software, providing various tools—including our popular monitor and printer test patterns and our browser-compatibility and Java performance tests—as well as information on downloading the ZD benchmark tests that *PC Magazine* uses to quantify PC performance.
—*John Clyman*

Smart Digital Cameras

Will your next digital camera have an operating system?

The digital camera market is going like gangbusters in Japan, which owns more than 65 percent of the worldwide market. Since many manufacturers launch products first in Japan, that market offers a preview of which products could soon land in U.S. stores.

In Japan the big sellers are the more expensive and advanced cameras, says Steve Saylor, vice president of marketing at FlashPoint—a newcomer that's proposing a standard for digital cameras.

Founded a year ago by 12 alumni of Apple Computer, FlashPoint calls in its specification for using an OS called Digita, which offers developers all the services of a full-fledged OS: serial, infrared, and USB features for I/O; localization features for building interfaces in multiple languages; and controls for removable memory, the file system, and communication.

Digita lets you review images in filmstrip fashion, capture photos, play them back in full resolution, pan, zoom, add audio annotation, transmit photos over an infrared port to another FlashPoint-compliant camera or printer, and update software via the Web. FlashPoint's key objective: to eliminate the need for a PC.

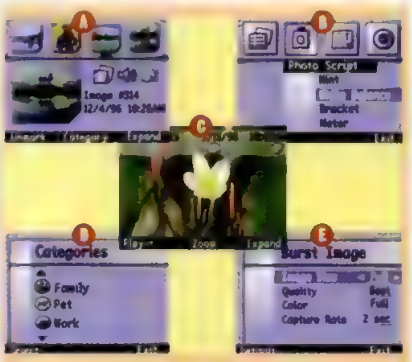
FlashPoint expects the first cameras to be available in the first quarter of this year. FlashPoint's Saylor contends that even a sophisticated camera with a resolution of 1,280-by-1,024 will "absolutely approach $500" in 1998. The initial licensees are Eastman Kodak, Minolta, and Sharp.

FlashPoint is now working with a group of Japanese camera manufacturers and the Japanese phone company NTT on a protocol for infrared transmission, which will let digital cameras talk to infrared public phones. It's planning to install kiosks at the winter Olympics in Nagano, Japan, to let people upload photos to the Web.

Enter Intel, which has proposed a standard that requires a PC. Intel says that simplifying cameras down to their essentials and moving most processing to the PC will make them less expensive.

Why would a computer chip manufacturer be interested in digital cameras? Quite simply, Intel wants a piece of the digital camera action, which market research firm IDC projects will reach sales of 12 million units a year by 2000. Currently Fujitsu, Hitachi, and MIPS are the leading suppliers of camera chips. Motorola, which is working with FlashPoint, is also trying to define a position in the market.

It's possible that the specs could coexist, with Intel initially filling the entry-level market and FlashPoint appealing to early adopters hungry for any high-end gadgets.—*Carol Levin*



THE COMPLETE PICTURE: *FlashPoint's operating environment runs on a camera's LCD panel* **A** Review mode **B** Camera controls **C** Play mode **D** Photo cataloguing **E** Capture preferences

JAKE KIRCHNER

How We Won the PC Revolution

When we started considering buying flat-panel monitors, I knew we'd reached a milestone in personal computing at *PC Magazine*. These desktop LCDs, with their stunning picture quality, showed up in the booth of just about every hardware maker and systems vendor at Comdex and wowed everyone who saw them. But even though their prices are dropping rapidly, they still cost about three times what conventional CRT monitors do.

For the average office worker, a flat-panel monitor is the computing equivalent of a Ferrari—a sign that either you're one serious hobbyist or you simply have more money than sense. But wouldn't one look good on my desk! When I got around to discussing them with our systems manager recently, he said, "Hmm, do you think we'll be buying any of them for our own use next year?" My response: "Only if the first one we buy is for me." Realistically, I know that their prices are still prohibitive.

The fact that we even considered them as part of our 1998 capital spending made me realize we had attained a PC manager's dream: a fully automated staff. Oh, we'll have to upgrade a few desktops and notebooks and continue to improve our network resources, just as every business does, but beyond that we're sittin' pretty.

Every member of the editorial staff has a desktop with sufficient processor, memory, and storage to run the operating systems and applications we'll need for at least the next several years. And we've just upgraded everyone's version of Microsoft Office and Lotus Notes. We have new network adapter cards, new network servers, and recently expanded storage space. Through that network, every staffer has high-speed access to the Internet. If necessary, staff members have notebooks and remote access to our network and the Internet for times when they're at home or on the road.

Of course, everybody has a phone on his or her desk, and (again, on a needs basis) staff members have cell phones or pagers for staying in touch when out of the office. In the office we have access to videoconferencing to stay in touch with our remote offices, and we have wireless networking to stay connected to our network when roaming the halls. Our conference rooms have ISDN service for videoconferencing and new 42-inch monitors.

Many of us have PDAs, such as PalmPilots and Rexes. Just about everyone has a monitor that's 17 inches—or larger. Our imaging group is completely outfitted with digital cameras and imaging software.

In short, if there's anything in the way of technology we need, we seem to have it. Of course, there will be new and better ways to compute and communicate and newer versions of key software, all of which will fuel our upgrade plans. And of course, since we're an organization that tests products for a living, we'll always be bringing in the latest hardware and software; but that's for purposes of producing editorial content, not to keep our operations humming.

Perhaps we're living in a fool's paradise and the next great wave of computing is about to crash over our heads—just as the Internet did three years ago—requiring another expensive round of hardware and software spending. But it's nice to enter the new year feeling that the PC revolution is over and that we won the war. How's the battle going at your place of business?

PHOTOGRAPH BY SHONNA VALESKA

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- **2.1GB Hard Drive**
- Modular UltraSlim VersaBay with Warm-Swap Technology Accepts 20X max Variable Speed CD-ROM, 1.44MB Floppy Drive and Weight Saving Module (all included)
- * Upgrade to 32MB RAM, add $159
- * U.S.Robotics x2 XJACK 56Kbps* Capable Modem, add $159
- * Versa PortBar 5000 with 10Base-T, add $249
- * VersaNote™ Ballistic Nylon Compact Carrying Case, add $59

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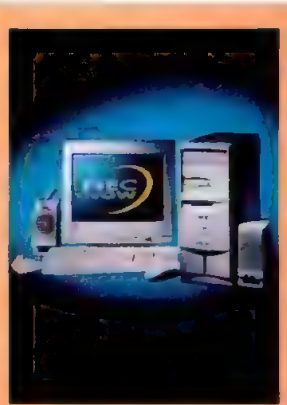

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MMX intel inside pentium

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- **4.3GB Ultra DMA Hard Drive**
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- Diamond Viper AGP, 4MB SGRAM Video Card
- Altec Lansing ACS-90 Speakers
- Upgrade to 64MB SDRAM Memory, add $129
- Upgrade to 6.4GB Ultra DMA Hard Drive, add $99
- Upgrade to NEC C700 17" Monitor (16" viewable), add $219
- Upgrade to Yamaha Wavetable Audio, add $49
- Upgrade to Altec Lansing ACS-45 Speakers with Subwoofer, add $39

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Direction SPL266

- **266MHz Pentium II processor featuring MMX technology**
- **32MB SDRAM Memory**
- **4.3GB Ultra DMA Hard Drive**
- NEC C550 15" Monitor (14" viewable)
- Number Nine Reality 334 AGP, 4MB SGRAM Video Card
- Altec Lansing ACS-90 Speakers
- Upgrade to 64MB SDRAM Memory, add $129
- Upgrade to 6.4GB Ultra DMA Hard Drive, add $99
- Upgrade to NEC C700 17" Monitor (16" viewable), add $219
- Iomega 100MB Internal Zip Drive with One Cartridge, add $99

$1999
Leasing Available Code #D5056

Direction SPL233

- **233MHz Pentium II processor featuring MMX technology**
- **32MB SDRAM Memory**
- **3.2GB Ultra DMA Hard Drive**
- NEC C550 15" Monitor (14" viewable)
- Number Nine Reality PCI, 4MB SGRAM Video Card
- Altec Lansing ACS-90 Speakers
- Upgrade to 64MB SDRAM Memory, add $129
- Upgrade to 4.3GB Ultra DMA Hard Drive, add $80
- Upgrade to NEC C700 17" Monitor (16" viewable), add $219
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NOTEBOOKS

Harnessing the Power

In this issue's First Looks, we profile some of the first notebooks to incorporate Intel's latest Tillamook chip, the 266-MHz mobile Pentium with MMX Technology. Though faster—and consequently more power consumptive—the chip is otherwise identical to the 200- and 233-MHz Tillamook offerings that debuted this past fall. In addition to the vendors covered in our main review, three other companies—AMS Tech, ProGen, and Quantex—will be offering 266-MHz portables at the time when Intel announces the chip's availability.

THE SECOND GENERATION: *Quantex Microsystem's 266-MHz notebook, the Quantex H-1331.*

The **Rodeo 5030ECX**—the latest notebook from AMS Tech (800-886-2671, *www.amstech.com*), an Irwindale, CA, operation devoted solely to mobile computing—uses the same basic design as the company's extant high-end product, the Rodeo 5020. Built around Intel's 2.8V Mobile Module—which holds, in addition to the processor, 512K of secondary cache—the 7.5-pound machine integrates a 4GB hard disk, a 20X CD-ROM, and a removable 1.44MB floppy disk drive. An XGA display, measuring 14.1 inches along the diagonal, is run by a 64-bit graphics chip set with 4MB of SGRAM memory.

The Rodeo's audio subsystem is built around a 16-bit chip set equipped with 3-D Stereo and Wavetable synthesis. It features external volume controls as well as line-in, speaker-out, and mic-in jacks. A USB port and an internal 56.6-Kbps K56flex modem are standard, whereas AMS Tech's DVD module and port replicator are optional. Equipped with 64MB of memory, the system sells for $5,000 (street). A three-year parts-and-labor warranty is included.

Like the Rodeo, ProGen Systems' 266-MHz portable—part of the newly denominated **ProGen Notebook Series** (800-848-1353, *www.progen.com*)—uses a 1.8V Mobile Module, only with a slightly smaller XGA screen. Measuring 13.3 inches across the diagonal, the display is driven by a 64-bit subsystem with 4MB of SGRAM and 3-D hardware acceleration. Audio is provided by a 16-bit SoundBlaster Pro compatible chip.

This three-spindle machine incorporates a 20X CD-ROM as well as a 1.44MB floppy disk drive and hard disk; an internal 56.6-Kbps x2 modem is standard. Three skews are available: a $3,649 model equipped with 32MB of memory and a 2.1GB hard disk, a $3,699 version that also includes integrates 10Base-T Ethernet, and a $3,799 machine that includes 48MB of memory and a 3GB hard disk. All models are accompanied by a copy of Infopedia, Home Office Suite 97, and a one-year parts-and-labor warranty.

The $4,299 **Quantex H-1331**, from Quantex Microsystems (800-346-6572, *www.quantex.com*), a Compal-manufactured machine similar to the Dell Inspiron covered in our main review, is a two-spindle model outfitted with a single modular bay. The bay can be used with a standard floppy disk drive, a 20X CD-ROM, or a secondary battery.

RECAP Our Tillamook notebook roundup in the issue of January 20, 1998, saw four systems in three categories recognized with an Editors' Choice award: The IBM ThinkPad 560X (subnotebook); the Gateway Solo 2300 (value); and the IBM ThinkPad 770 and NEC Versa 6230 (high-end).

At the core of the system is a 266-MHz MMX Pentium and 512K of secondary cache sitting on a Mobile Module, 64MB of SDRAM, a 4GB hard disk, and a 128-bit graphics chip set (4MB of VRAM). The machine does not have an internal modem, although it does include a 56.6-Kbps PC Card modem. The H-Series includes USB ports, Fast IR, and zoomed video support. Like the Rodeo models and the ProGen Notebook series, the Quantex H-1331 integrates a touch pad pointing device for mouse functions.

The base system, which is sold direct by Quantex, ships with a carrying case and a copy of Microsoft Office 97 Small Business Edition (a mini-docking system costs an additional $199). The company warranty extends for three years with respect to the CPU and main memory and one year with respect to all other hardware. The H-Series—which represents desktop PC vendor Quantex's first foray into the notebook market—first debuted last September with a 233-MHz Tillamook machine. —*Cade Metz*

THREE CHOICES: *ProGen Systems has three 266-MHz systems from which you can choose.*

Digital's Business PCs Hit $999

The celebrated segment zero PC isn't limited to home users. Digital Equipment Corp. (800-344-4825, *www.windows.digital.com*), a mainstay in the enterprise PC market, has introduced a pair of corporate machines that sell for less than $1,000 apiece on the street. Both versions of the Digital PC 3010 are part of a recently rechristened value product line once known as Venturis, and both benefit from the company's Unified Memory Architecture, an onboard chip that combines core logic and graphics control.

The Digital PC 3010 is available with either AMD's 166-MHz K6 processor for $900 (street price) or Intel's 166-MHz MMX Pentium for $970 (street price). Each machine is based on the highly accessible NLX motherboard form factor and includes 16MB of SDRAM and a 1.2GB S.M.A.R.T hard disk. S.M.A.RT. technology and all DMI 2.0 specifications are supported by a bundled copy of ClientWork, an Explorer-like management solution.

The base prices for these machines do not include monitors. In addition, the company has concurrently lowered prices on its four other corporate lines: the $1,049 PC 3100, which increases the 3010's hard disk size to 2GB; the $1,599 PC 5100, a 200-MHz MMX Pentium with 32MB of SDRAM, a 2GB hard disk, and a 24X speed CD-ROM; the $2,088 PC 5400, essentially a PC 5100 with a 200-MHz Pentium Pro processor; and the $2,953 PC 5500, which includes a 266-MHz Pentium II processor, 32MB of SDRAM, a 4GB SCSI hard disk, and a 24X speed CD-ROM drive.—*CM*

UTILITIES

Virus Hunt: Part Two

Fresh on the heels of Symantec's latest announcements (Trends *Software*, January 20, 1998) comes another batch of new options.

Computer Associates International (800-243-9462; *www.cai.com*) is offering **Inoculan Anti-Virus for Windows 95** ($40 street). Designed for the consumer and small office markets, Inoculan provides real-time detection of viruses, including over 1,000 macro viruses. It features single-button signature file updates, software upgrades, a real-time virus detection monitor, and a virus-cleaning wizard. The software also comes with support for Microsoft Office 97, single disk-disaster recovery, an integrated virus encyclopedia, and support for encrypted Internet files and compressed file formats. In addition, Inoculan includes free online virus-signature updates and 24-hour online support.

Panda AntiVirus for Windows 95 ($45 to $100 street, depending on the package), from Panda Software (800-603-4922, *www.pandasoftware.com*), detects and removes known and unknown viruses and offers constant updates and a hotline service. The software is compatible with Microsoft Windows 95, Windows 3.*x*, and DOS. The installation of the components necessary for working under Windows 95 is automatic, as is the update feature. Panda's scanning system examines your hard disk in a few seconds, detecting more than 13,000 viruses; scanning compressed files with .ZIP, .ARJ, .LZ, and .EXE formats; and effectively disinfecting infected programs. A heuristic scan method is capable of detecting new viruses not yet recognized by conventional scan systems. Panda's virtual driver feature (VXD) supervises the file traffic and applications used on the system, and it can detect any virus while the user performs other tasks.

Meanwhile, two products are gearing to protect your system from outside threats that travel via the Internet. From eSafe Technologies (888-772-3372, *www.esafe.com*) comes **eSafe Protect** ($70 street). eSafe strives to provide preventive measures against Internet "vandals"—including viruses, hostile Java applets and ActiveX controls, and infected push content, e-mail attachments, and plug-ins. You can also control an outside application's access to your system resources, modem information, and file and network accessibility. For protection against more mundane viruses, eSafe integrates the company's ViruSafe antivirus software. There is even basic filtering (which allows you to restrict access to Web sites) and the ability to erase cookies upon booting your computer.

Along similar lines is CyberMedia's **Guard Dog Deluxe** (310-664-4720, *www.cybermedia.com*). Guard Dog ($60 street price) focuses on the various aspects of security that are relevant to Internet users. For instance, the software automatically protects against hostile ActiveX controls and Java applets, provides blocks for unwanted cookies, and cleans up the trail left by your Web surfing sessions. The program's Internet Guardian works in the background, monitoring individual Internet sessions and providing an alert when there's an intrusion into your system. Like eSafe, Guard Dog allows you to control the information that outside applications can legally access. In addition, there's a full antivirus package (based on technology from Trend Micro).—*Yvonne Koulouthros and Melissa J. Perenson*

WEB SITES

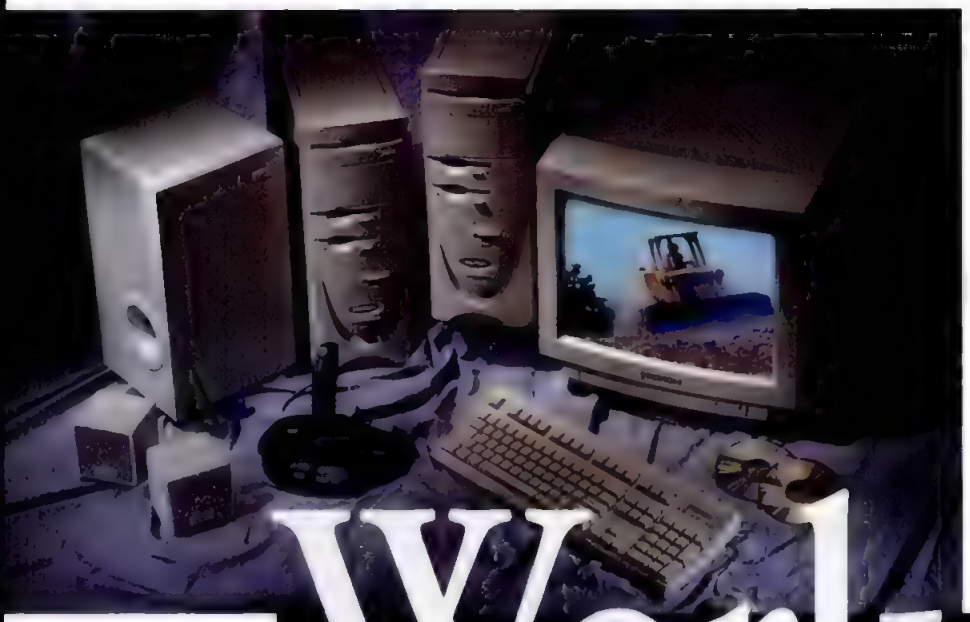
Software Shopping Online

Purchasing software over the Internet has not yet taken as strong a hold on the popular imagination as might be expected. Though shareware and demo versions have long been popular, actual purchasing over the Web has been limited to the few vendors who have set up online store capabilities. New developments in e-commerce are allowing customers to go to a third party outlet (mail order, physical, or virtual store), buy directly from the vendor, or sample a product (through shareware or a demo).

Chumbo.com is an e-commerce company that promises immediate access to the latest software titles. It offers a large selection of software at reasonable prices in an effort to rival mail order companies and actual stores. The site also provides users with product reviews and news from Ziff-Davis publications. Chumbo.com's strategy is not dissimilar from that of Amazon.com, as it cuts out the middleman and attempts to keep prices low.

BuyDirect.com is a site that helps you purchase software products directly from their developers over the Internet. Most of the products focus on Web enhancement software, such as browsers, Internet utilities, HTML editors, plug-ins, and applets. These are instantly downloadable directly after purchase. Secure Internet transmissions are used to protect customer transactions and personal information.

A casual search for "shareware" on the Web will bring a deluge of sites promising all types of products in many mutually exclusive formats. Many of these sites specialize in shareware and demo versions of popular (and more obscure) software. To avoid random searches, **Filez.com** has an index of download sites. **DemoNet.com** is a library dedicated to assembling and maintaining a comprehensive list of software titles. **Jumbo.com** provides over 200,000 free programs, downloads, and shareware. **Shareware.com** offers a similar service and also provides links to Download.com, **Gamecenter.com**, and other software resources. The **ZDNet Software Library** can be found at *www.hotfiles.com*. —*Sharon Nash*



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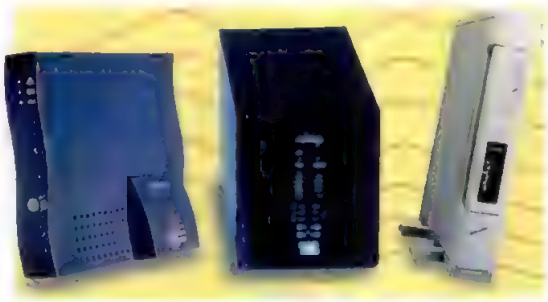
UPSs

Keep the Current Flowing

Whether you're a home user or a business network administrator, you should consider investing in an uninterruptible power supply (UPS) to protect your PC from power sags, surges, overvoltages, and brownouts. By moderating and augmenting your PC's flow of electricity, these new UPS products can prevent data loss and damage to your hardware.

New from Best Power (800-356-5794, *www.bestpower.com*) are the latest entries to the **Patriot Pro** line. Available in 400-VA (volt-amperes), 750-VA, and 1-kVA capacities ($299, $449, and $529, respectively), this family of UPS products is designed to safeguard SOHO PCs as well as networked units like Unix and CAD/CAM workstations, client desktops, and small business servers. Each model incorporates Best Power's PowerSteady voltage regulation, which conditions the electric current into a pure sine wave for cleaner performance.



PROTECTING YOUR INVESTMENT: *Uninterruptible power supplies from MGE, IPT, and XS.*

Five LEDs on the front panel of each Patriot Pro provide information on power quality, battery operation, and battery replacement status. Alarms will sound when dangerous power conditions arise.

XS Technologies (888-978-3241, *www.xstech.com*) is now selling its sleekly designed **Strata Power Command Center**, which lets you monitor and control the electricity for up to five connected devices. There's a master switch for powering down all of the machines simultaneously as well as a clever detachable control panel that indicates precise power levels and backup time and alerts you to a variety of problem conditions.

The Strata is available in two different models. The $499 **Strata 800C** is rated at 880 VA, which is enough to protect a high-end workstation with a large-screen monitor and associated peripherals. At 1 kVA, the $699 **Strata 1000C** can power an entry-level network server and its monitor. Both units can be rack-mounted with a $145 optional kit.

International Power Technologies (800-944-0356, *www.iptinc.com*) has added new models to its **Anzen** family of intelligent UPSs. The $395 **Anzen I-500**, $555 **Anzen I-800**, $785 **Anzen I-1100**, and $869 **Anzen I-1500**, which range from 500 VA to 1500 VA, are targeted at the high-end networked PC market. All offer individual outlet switching (which enables users to turn off parts of the UPS load without affecting other connected hardware) and pure sine wave output.

MGE UPS Systems (800-523-0142, *www.mgeups.com*) is offering the compact $129 **Pulsar Desktop 220+**, which weighs in at only 3 pounds and is the size and shape of a videocassette. The Pulsar offers 220-VA protection for desktop PCs as well as surge protection for your modem line. The unit comes with MGE's SolutionPac97 software, which gives you monitoring control over the UPS's battery, output voltage and frequency, and status information on protected devices.—*Roderick A. Beltran*

NETWORK PRINTERS

Prints and Scans for LANs

Printing across a network is getting faster and more robust at every turn. Thanks to products from Xerox and Printronix, you can now manage both front-office and back-office print tasks from a remote server.

Xerox Corp. (800-275-9376, *www.xerox.com*) has recently unveiled the three latest entries to its **Document Centre** line of high-end laser multifunction printers. Each model comes with a 100-MHz PowerPC 603 chip, 32MB of RAM (which is expandable to 128MB), a 2GB hard disk drive, and a 10Base-T Ethernet adapter. Each printer also includes Xerox's CentreWare software package for managing printing and other network resources.

SPREADING THE WORD: *Network-ready models from Printronix (left) and Xerox (right).*

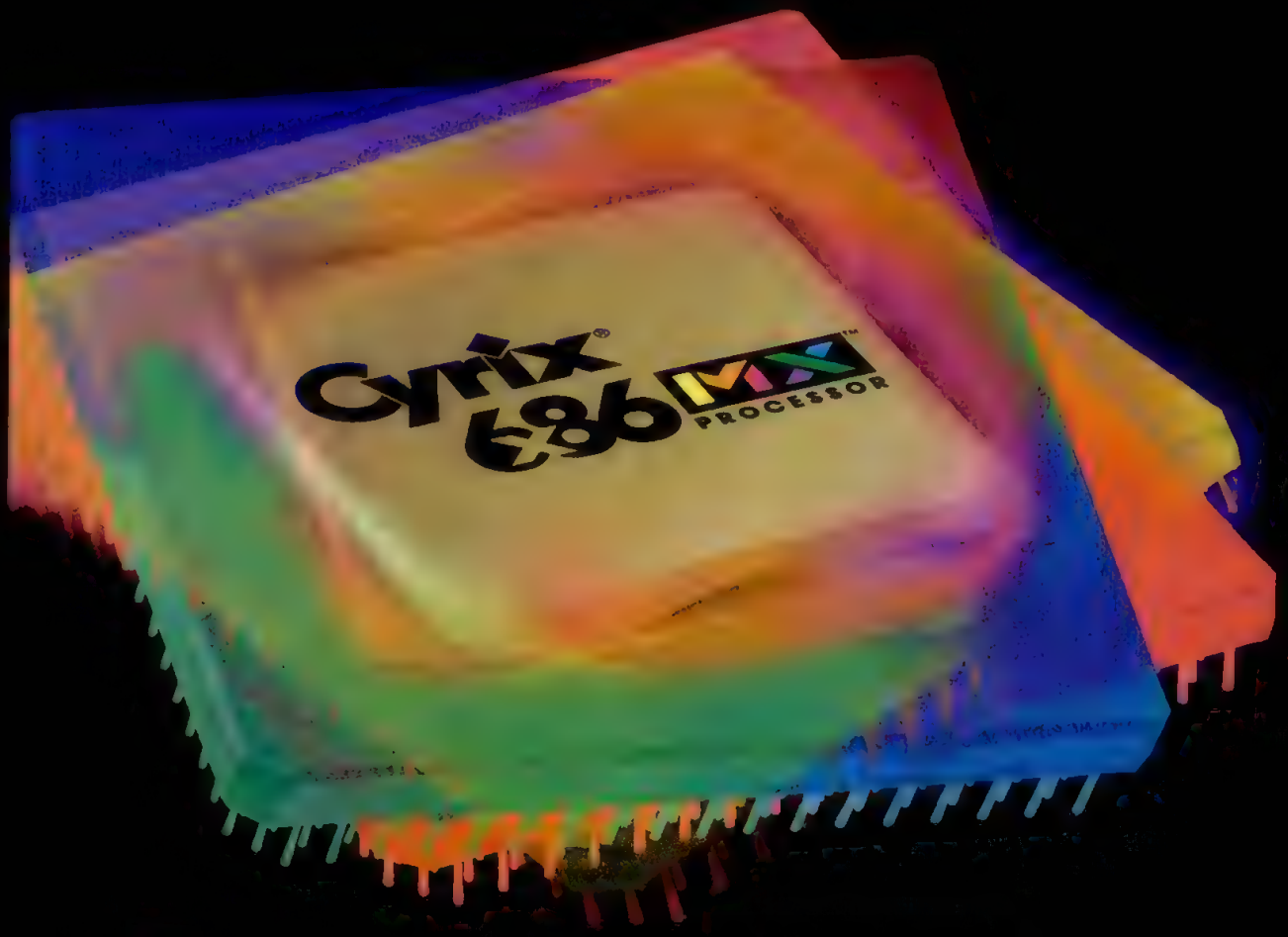
The $8,995 **Document Centre 230LP** is a 30-page-per-minute network laser printer that can be turned into a multifunction device via a $1,995 upgrade that allows for scans and copies. The $11,595 **Document Centre 220ST** is a multifunction device that combines a 20-ppm laser printer with a built-in scanner and copier. At the high-end is the $14,995 **Document Centre 230ST**, which combines a 30-ppm laser printer with a scanner and copier.

For heavy-duty back-office tasks such as invoices and labels, Printronix (714-863-1900, *www.printronix.com*) is offering a series of networked line-matrix solutions. Each printer comes with the company's new PrintNet 10Base-T Ethernet card. The **ProLine P5209** ($7,900 street price) can print 900 lines per minute, while the **ProLine P5214** ($11,000 street price) is a cabinet-model line printer that prints 1,400 lines per minute. The flagship $34,995 **LaserLine 5035** is a 35-ppm laser printer that has a 300,000-sheet monthly duty cycle. The LaserLine 5035 can print on cut-sheet letter-size paper as well as continuous 16-inch-wide forms. —*Josh Levy*

Pictures and Pixels

Need a faster, easier way to transfer data between your digital camera and PC? Look for the **CameraConnect** external PC Card and Compact Flash reader, from ActionTec Electronics (800-797-7001, *www.actiontec.com*). Priced at $149.99, the CameraConnect attaches directly to the parallel port of any desktop PC and allows data transfer rates of 800 to 900 Kbps.

Image transfer can be performed via Type I and Type II PC Cards, Compact Flash cards, or ActionTec's own CameraCard. The CameraConnect also includes data transfer software.—*RAB*



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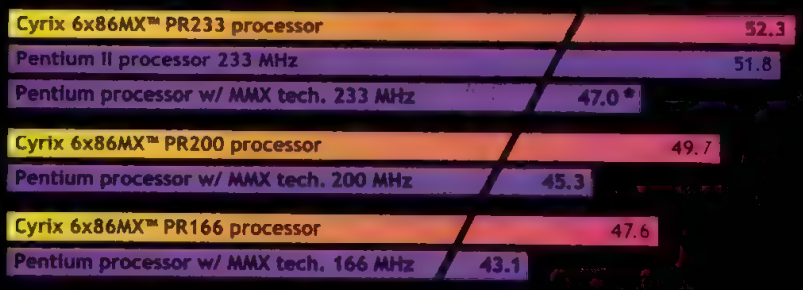

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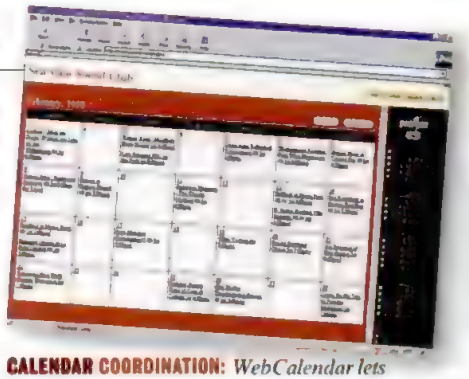


CALENDAR COORDINATION: *WebCalendar lets groups publish their schedules on the Web.*

Companies frequently include many telecommuters and branch offices, but how do they all stay on the same track? Software scheduling companies are banking on the Internet to solve this problem.

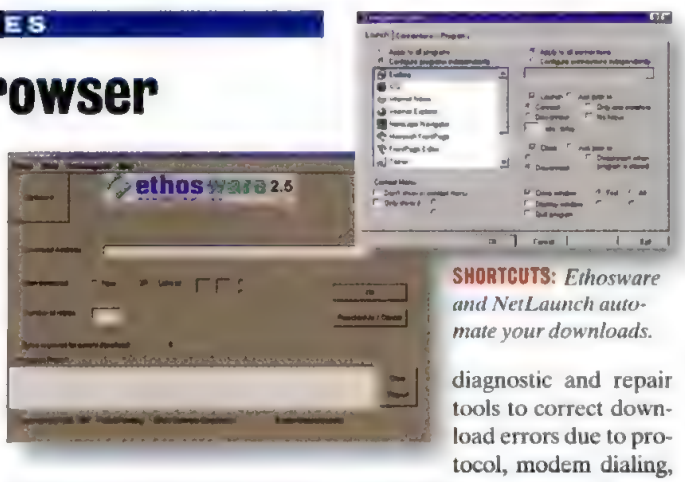
From Pacifica Software (800-755-9036, *www.pacificasoftware.com*), a division of MySoftware Company, comes **WebCalendar**, an online calendar aimed at clubs, schools, and other private organizations that wish to post their events to the public. The program features password protection and the ability for multiple individuals with 'author privileges' to edit or modify existing entries and create new ones without knowing HTML. Pacifica WebCalendar sells for $50 (street price), and the first year of publishing (up to 20 calendars) is free; after that, publishing time costs $50 a year or $10 a month.

EventCenter 1.0, from Amplitude Software Corp. (415-659-3500, *www.amplitude.com*), also offers dynamic calendars that can incorporate multimedia-rich information in a Web-based remote authoring system. Geared toward those with little technical know-how, EventCenter lets sanctioned visitors publish and update events quickly and easily. Participants may then search and subscribe to event calendars. Subscribers can receive e-mail if changes occur in a calendar. EventCenter is priced at $2,995.

WebMan Technologies' **Timecruiser** system (973-244-7856, *www.webmantech.com*) builds its calendar framework using Java-based *Capplets* (or calendar applets). New features in the recently released Version 1.2 include the option of HTML formatting for all calendar items. Event publishers can schedule meetings, coordinate agendas, organize and manage documents, and attach their own multimedia items to calendar events. A one-time purchase of the standard-edition file system with 25 calendars is $650, and a rental plan with 25 calendars is available at a $25 monthly or $250 annual rate.—*Stephanie Lindenbaum*

BROWSER UTILITIES

Better Your Browser



SHORTCUTS: *Ethosware and NetLaunch automate your downloads.*

In an effort to make your Internet time more efficient, updated browser utilities are increasingly improving the ways you can download material, launch programs, and perform unattended Internet tasks.

Ethosware 2.5, available for $24.95 from Ethos Software Corp. (617-859-1789, *www.ethosware.com*), lets you cut and paste the addresses of files you want and schedule their download times. Ethosware connects to the Internet, downloads designated files to your desktop, and then closes your Internet connection.

You can also use Ethosware's diagnostic and repair tools to correct download errors due to protocol, modem dialing, and Internet connection errors (such as busy signals or low bandwidth). The deferred-download feature gives you the flexibility to download big files when you're away from your computer or at night when Web traffic is low.

Maximize your Internet time by using **NetLaunch 3.13a** (*www.primenet.com/~simpson*) to launch or close e-mail, Web browsers, and news service programs automatically when you connect or disconnect from the Internet. To add programs to the launch list, you simply drag shortcuts into the launch-list window. Then you can configure each program in the preferences screen. Each program and dial-up connection can be configured independently.

Auto WinNet95 4.1 (800-242-4775, *www.webcom.com/autownet*) can perform unattended Internet tasks on a scheduled basis. You can customize the automation routine for dial-up, file transfers, Web navigation, and e-mail. For example, Auto WinNet95 can automatically dial into your provider, run an agenda, and then hang up.

For e-mail, you can set up an unlimited number of multiple mailboxes for all of your e-mail accounts. Auto WinNet also supports advanced formatting, checks your mailboxes, and deletes messages from the server. Auto WinNet costs $29.95 with unlimited free upgrades and can be delivered via e-mail. —*Doug Beizer*

Free Stuff on the Web

PERKING UP: *IncentiveWare.*

If your company has an Internet presence, you'll want to make a one-to-one connection with your customers. Two new services are making it that much easier to build a relationship with your customers while giving them something of value in return.

InternetPerks (888-277-3757, *www.internetperks.com*) recently launched **IncentiveWare**, an affinity marketing effort that lets you deliver small software gifts to your customers. When you sign up with InternetPerks (the fee is $4,995 for a three-year contract to get rights to any of InternetPerks' IncentiveWare offerings), people can download free software programs (such as date calculators or toll-free directories) from your site. You can also distribute them via e-mail.

If you're literally selling goods and services online, you can use **e-centives**, from Emaginet (301-564-6700, *www.emaginet.com*), to extend promotions and discounts to customers in a personal way. A partner company can place a spinning "e" on its site to signify a promotion. When clicked, the "e" will send people to the Emaginet site to complete a demographic survey, which lets you learn more about your customers. The annual server license fee of $10,000 covers $5,000 worth of transactions (additional transactions begin at 10 cents each).—*David Lidsky*

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5010ECX	233MHz Pentium® Processor	3.1GB HDD	64/128 MB RAM	14.1" XGA TFT	56K Modem	20X CD-ROM	$4595.00
5000ECX	233MHz Pentium® Processor	3.1GB HDD	32/128 MB RAM	14.1" XGA TFT	56K Modem	20X CD-ROM	$3995.00
3030ECX	233MHz Pentium® Processor	4.0GB HDD	64/128 MB RAM	14.1" XGA TFT	56K Modem	20X CD-ROM	$4495.00
3020ECX	233MHz Pentium® Processor	3.1GB HDD	64/128 MB RAM	14.1" XGA TFT	56K Modem	20X CD-ROM	$4295.00
3015ECX	233MHz Pentium® Processor	2.1GB HDD	32/128 MB RAM	14.1" XGA TFT	56K Modem	20X CD-ROM	$3595.00
3010ECX	200MHz Pentium® Processor	3.1GB HDD	64/128 MB RAM	14.1" XGA TFT	56K Modem	20X CD-ROM	$3995.00
3000ECX	166MHz Pentium® Processor	3.1GB HDD	32/128 MB RAM	14.1" XGA TFT	56K Modem	20X CD-ROM	$3595.00

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PC CARD MODEMS

56K Hits the Road

Though 56K technology has yet to deliver on all of its promises, it has raised the bar for modem performance. We all want faster connections—especially on the road—and a new group of PC Card modems delivers just that.

To achieve speeds over 33.6 Kbps, you must have only one analog-to-digital conversion. Road warriors often miss out on the benefits of 56K, because they're connecting from behind hotel PBXs (which add at least a second conversion and knock the speed down to 33.6 Kbps).

Particularly appealing to road warriors is Ositech Communications' universal PC Card solution, which can be used with any phone line (519-836-8063, *www.ositech.com*). The **Jack of Spades** ($400 street price) K56flex modem features Ositech's Digital Phone Interface (DPI), which lets you connect over analog, cellular, and digital phone lines. The Jack of Spades also offers advanced networking capabilities by incorporating a full duplex 10/100Base-TX adapter that takes advantage of the high bandwidth architectures of some notebooks. The card uses Etherboost technology to streamline data transfers.

Hayes Microcomputer Products (770-840-9200, *www.hayes.com*) offers a rugged solution with the K56flex **Optima 56K PC Card** ($200 street). The modem features Hayes' EZjack pop-out connector design, recently improved to provide a longer life to the fragile connectors. The card also has a sleep mode that lowers power consumption while idle. Hayes offers an optional connector ($40 street) that allows connectivity with cellular phones.

Longtime leader in the European PC Card market, Psion Dacom (888-322-6601, *www.psiondacom.com*) enters the US market with the $249 K56flex **Gold Card Global 56K**. The card features Psion Dacom's Gold Card Global architecture, which is approved for use in 23 countries. The modem also offers a wide array of additional features, including adapter modules for ISDN connectivity and GSM/PCS for digital cellular phones.

Stepping up to provide a global reach is 3Com Corp. (800-527-8677, *www.3com.com*). The $269 **3Com Megahertz 56Kbps International PC Card, model CC1560i,** is an x2 modem designed for use in over 250 countries. In countries where x2 support is not available (x2 is currently available in over 30 countries), the modem will function at 33.6 Kbps. The 3Com CC1560i comes with the vendor's WorldPort software utility, which makes it easy to configure the modem in any of the supported countries. Also included with the modem are phone adapters for use in the United Kingdom, Germany, and France. For the truly untethered, the card is cellular-ready for Motorola and Nokia cell phones—*Michael N. Rusignuolo*

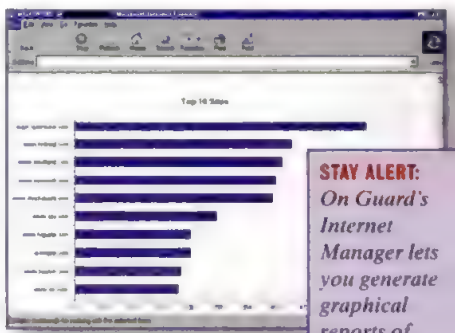
NETWORK MONITORING TOOLS

Watching Your Surfers

As the Internet becomes an indispensable business tool, you may wonder how to prevent your workers from using it for nonbusiness activity. Two new monitoring applications help enforce corporate Internet-usage policies by capturing and logging network activity and blocking Web sites.

NetPartners' **WebSense Reporter Pro 1.0** (800-723-1166, *www.websense.com*) generates reports on Internet activity by company department in batch-mode and real time. You can customize reports to show things like traffic between workstations and Web sites, top sites visited, and total bytes downloaded.

Reporter Pro ($495 per workstation) uses the WebSense master database, a collection of over 125,000 restricted Web sites in 29 categories developed and maintained by professional Web surfers. Reporter Pro automatically downloads WebSense database updates every night. Managers can put URLs in the database, or they can add sites locally with the Custom category.



STAY ALERT: *On Guard's Internet Manager lets you generate graphical reports of Web activity.*

On Technology's **On Guard Internet Manager 4.1** (617-374-1400, *www.on.com*) generates reports by date and time for a specific person, group, or whole network (it will be rereleased as Elron Electronics Industries' Elron Internet Manager in the first quarter of 1998). It has a Web interface that lets managers access usage reports from anywhere on the network. Reports can tabulate activity such as top-ten sites visited, Internet usage by hour, workstation usage, and site details.

On's SmartList technology automatically produces and utilizes a list of restricted Web sites with the help of a Suspect Dictionary. Office managers create the dictionary by submitting keywords like "nude" or "sports," and the Internet Manager blocks all attempts at opening new sites containing those words. These new suspect sites are then added to the restricted list. Pricing for Internet Manager starts at $2,995 for 50 users. —*Emily Cohen*

Smile for the E-Mail

No matter how many colon-and-parentheses smiley faces you use to punctuate your e-mail, you can't ease the cold formality of text-only messages. Zap! International (888-445-9440, *www.zap-mail.com*) has a friendlier solution with its Zap! Video E-mail system ($200 street).

This Windows-based e-mail solution includes a color camera, a Plug and Play PCI camera interface board, Zap! Video E-mail application software, and all the necessary cables and adapters. Zap! lets you record a video message and send it as an attachment to anyone with a valid e-mail address using a machine running Microsoft Windows 3.1 or Windows 95. Recipients can view each Zap! Message—containing an audio-video recording and a text message—without plug-ins or extra software. Just double-click on the Zap! attachment and a player launches for you.—*Stephanie Lindenbaum*

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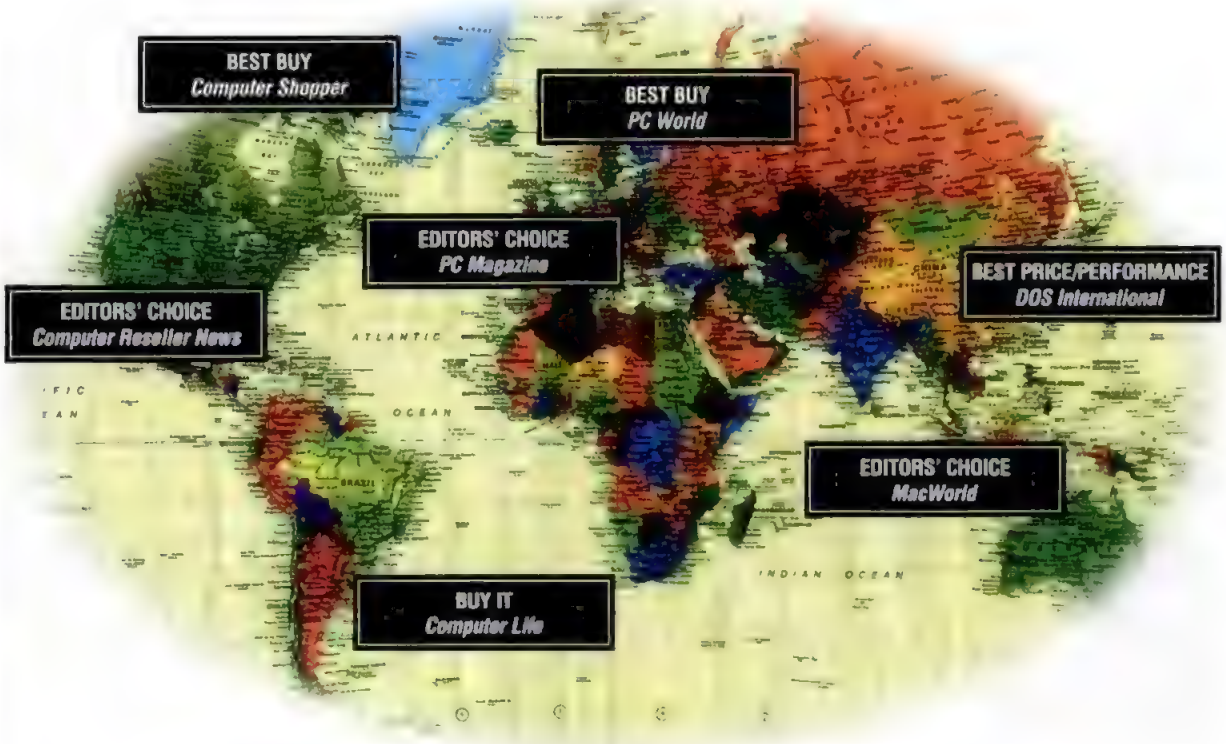

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First Looks

On the Road at 266 MHz

Intel's power-conscious Mobile Pentium Processor with MMX Technology gets a speed boost to 266 MHz. PC Labs tests six notebooks with this new CPU.

By Cade Metz

To the certainty of death and taxes add faster Intel processors. Enhanced silicon from Oregon is a sure thing, arriving in PCs almost every six months. In the notebook market, the latest offering is the 266-MHz Mobile Pentium with MMX Technology, a continuation of the CPU genre code-named Tillamook.

Here we review 266-MHz portables from Akia, Dell, Gateway, Hitachi, Micron, and NEC. You'll also find a sidebar on Toshiba's Tecra 550CDT in this story as well as reviews of the IBM ThinkPad 380 and Compaq's Tillamook units on our Web site *(www.pcmag.com)*.

The inaugural Tillamook introduced last September was the first CPU to boast 0.25-micron construction. With a shorter distance between each transistor, the CPU not only reached faster clock speeds—200 and 233 MHz—but required less power to do so. Thanks to a 1.8V inner core and a 2.45V I/O, power consumption was under 5 watts. Thus the processor allowed for significantly longer battery life.

With the new 266-MHz Tillamook, much of that additional battery life is surprisingly maintained, even though the chip's core operates at 2V. Though a couple of the notebooks here lost a few minutes on our BatteryMark test, the Gateway Solo 9100 and the Micron TransPort XKE 266 improved on their times over their 233-MHz brethren ("High-End Notebooks," January 20, 1998).

The trade-off (when there is a trade-off) is for additional performance. The 266-MHz Tillamook runs 14 percent faster than its 233-MHz predecessor. This does not translate linearly to CPUmark and Winstone 98 scores, however. On average, CPUmark scores improved by 9 percent, whereas Winstone results rose only 3 percent.

Considering such results, the 266-MHz Tillamook is largely a place holder. It's an improvement, but it is less significant than the arrival of the mobile Pentium II—a sub-8-watt version of the Deschutes design that will debut within the next six months.

Akia Corp.

Akia Tornado TX266

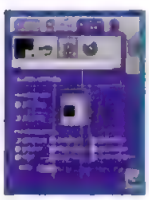
This successful Japanese company, which opened a subsidiary in Austin, Texas, last fall,

INSIDE

NOTEBOOK PHONE: The Com.plete PC Card is a modem with a built-in cell phone. See *page 58* for the review.

UNIVERSAL E-MAIL: E-Corp's e-mail 97 includes message translation for six languages. For the review, see *page 58*.

IT'S JUST A WEB THING: With Parable's Thing-Maker, nonprogrammers can create Web-based multimedia. For the review, see *page 66*.



ANSWERING MACHINE: ASP Computer's EZMail lets you know when you've received messages. See *page 76*.

More Products Reviewed . . .

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PHOTOGRAPHY BY LES MORSILLO

offers a slight improvement in its 233-MHz offering with the Tornado TX266.

Priced at $4,100, the machine is equipped with a 266-MHz Tillamook CPU, 32MB of EDO memory, and a 4GB IBM hard disk. There are two modular bays: One accepts only the system's primary battery, while the other can accommodate a 20X max CD-ROM, a 1.44MB floppy disk drive (which can be used externally via the parallel port), or an optional $189 second battery. A K56-flex PC Card modem sells at an additional cost of $149.

On the left of the system are two Type II PC Card slots, while on the right are speaker-out, line-in, and microphone jacks and a PS/2 port. Integrated on each side are the system's two stereo speakers, which, in conjunction with an FM synthesis-equipped audio subsystem, produce sound that is of low quality, even for notebooks.

The 13.3-inch LCD screen is driven by a NeoMagic 128XD chip set and 2MB of VRAM graphics memory. The display is capable of 1,024-by-768 resolution at up to 16-bit color. An 800-by-600 mode fills only a portion of the screen, but it does support 24-bit color. The functional keyboard does not include dedicated "Home" and "End" keys, and the touch pad sits just right of center relative to the keyboard's spacebar (improper positioning for touch-typists). The lightest machine in this roundup, the Tornado TX266 weighs just over 6 pounds without the AC adapter.

The standard set of rear I/O ports includes a composite video-out port, a Fast IR interface, and a USB port. The latter was improperly configured on the system that we tested, but we were able to correct the situation by removing the port from the Microsoft Windows 95 Device Manager and then reinstalling it.

The Tornado TX266 produced the roundup's highest CPUmark score (a reflection of its unusually fast processor subsystem) but subpar hard disk performance kept it from scoring any more than average on our Winstone tests. Whereas CPUmark and Winstone scores were slightly better than those of the Tornado TX233, Disk WinMark results were 4 percent lower (the Tornado TX233 uses a 3.1GB Hitachi drive, while the Tornado TX266 uses a 4GB IBM drive). Graphics performance, up 5 percent, was also average relative to the that of the 266-MHz competition. With just the primary lithium ion battery installed, the system ran for 2 hours and 51 minutes on our Battery WinMark test—20 minutes less than its 233-MHz sibling but on par with the other systems in this roundup.

In spite of some shortcomings, the Tornado TX266 incorporates nearly everything that's expected of a leading-edge business portable.

Direct price: $4,100 (32MB), $4,299 (64MB)
Akia Corp., Austin, TX, 800-936-5481, 512-339-4804
www.akia.com
Choose 410 at www.pcmag.com/infolink

Dell Computer Corp.

Dell Inspiron 3000 M266XT

Dell's latest portable, the Inspiron 3000 M266XT, is an extraordinary bargain, identical to the original 233-MHz Inspiron. The 6.8-pound system offers a user-friendly design and top-tier performance at a price usually associated with value-based systems.

For only $3,599, you get a 266-MHz Tillamook system, 32MB of SDRAM, a 4GB UltraATA hard disk, and a 13.3-inch XGA display. The two-spindle machine is equipped with a multifunction modular bay and a dedicated battery bay. You can remove the contents of these two adjacent bays by simply releasing a pair of latches on the machine's underside. The multifunction bay, like that of the Akia Tornado, can be used with a 20X max CD-ROM module, a floppy disk drive, or an optional second battery ($169).

On the left side of the system, adjacent to the hard disk, there are two Type II PC Card slots with Zoomed Video support and three audio ports (speaker, headphone, and microphone). The system's integrated speakers re-

BENCHMARK TESTS

266-MHz Pentium MMX Notebooks

What exactly does an extra 33 MHz buy you in a notebook? Well, compared with the 233-MHz Tillamook notebooks that we reviewed in our January 20 issue, anywhere from nothing to about 9 percent increase on our ZD Business Winstone 98 tests, depending on the system. On the average, you should expect about a 3 to 5 percent boost in Windows applications performance.

The better news in this scenario is battery life. Nearly all of the systems here lasted longer on our ZD BatteryMark test than their 233-MHz counterparts. Our Editors' Choice, the Micron TransPort XKE 266, extended its class-leading battery time to nearly 4.5 hours.

Bold type denotes first place.	ZD Business Winstone 98 Score	ZD Business Graphics WinMark 98 Score	ZD Business Disk WinMark 98 Thousands of bytes/sec	ZD CPUmark$_{32}$ Score	ZD CD-ROM WinMark 98 Thousands of bytes/sec	ZD BatteryMark Hours:minutes
Akia Tornado TX266	15.5	64	757	**518**	1,070	2:51
Dell Inspiron 3000 M266XT	16.2	78	913	502	974	2:47
Gateway Solo 9100	15.4	67	905	490	1,080	4:13
Hitachi VisionBook Pro	15.0	61	900	497	1,080	2:02
Micron TransPort XKE 266	**16.6**	**82**	**926**	516	**1,110**	**4:29**
NEC Versa 6260	16.3	**82**	902	512	1,060	2:20
	BETTER ▶	BETTER ▶	BETTER ▶	BETTER ▶	BETTER ▶	BETTER ▶

Editors' Choice

• Micron TransPort XKE

PC MAGAZINE EDITORS' CHOICE

Until the mobile Pentium II debuts in new systems in the middle of this year, users looking for the latest and greatest notebook will have to choose among the new crop of 266-MHz Tillamook-based portables. But don't think that choosing among the six systems reviewed here means you'll have to settle for less. Each notebook offers active-matrix XGA displays, plenty of hard disk space, and loads of memory.

Our Editors' Choice in this roundup is the Micron TransPort XKE 266 ($4,740 direct). With its 32MB of EDO RAM, huge 7.8GB UltraATA hard disk, 13.3-inch XGA screen, swappable 20X CD-ROM drive, and cellular-ready 56K modem, the Micron TransPort XKE 266 is the best performing and most versatile of the group.

The Micron TransPort XKE 266 also headed the pack with the best scores on most of our benchmark tests. It produced a Winstone score that's the highest we've seen for any *x*86 portable. A major feature of the new Tillamook processor should be improved battery life. Though this wasn't the rule, the Micron TransPort XKE 266's BatteryMark score was exceptional, lasting 4 hours and 29 minutes, just edging out the other top performer: the Gateway Solo 9100 Multimedia Notebook.

Another notebook worth mentioning is the NEC Versa 6260 ($4,299 direct), which ran a close second to the Micron TransPort XKE 266 on our performance tests. We were particularly impressed by the NEC Versa 6260's VersaBay II. This multipurpose bay can hold a variety of optional accessories, namely a 20X CD-ROM drive, floppy disk drive, a second battery or hard disk, a Zip drive, or an LS-120 drive. NEC makes the Versa 6260 DMI 2.0–compliant and includes Intel's LANDesk Client Manager.

side above its keyboard, just below the 13.3-inch display. The display—capable of XGA resolution up to 16-bit color—has a full-screen 800-by-600 mode, but using it renders fonts choppy and windows cartoonish.

There's the usual complement of I/O ports—serial, parallel, VGA, docking station, and PS/2—although as with the Akia Tornado, we had to reconfigure the Inspiron's USB port before it would recognize a USB device. The Inspiron is equipped with an excellent keyboard. Unfortunately, there's no "Standby" mode key; the system will automatically enter "Standby" mode after a certain length of inactivity, a value set within the system BIOS. You can send the machine into "Suspend" mode, which saves more power than "Standby" but takes longer to exit.

The Inspiron's benchmark test scores were very impressive. The Inspiron M266XT performed 13 percent better on our CPUmark test than its 233-MHz sibling, the Inspiron M233XT. Disk WinMark and Winstone scores also rose slightly, as did the unit's performance on our Graphics WinMark test. Overall, the Inspiron's scores were right on par with this roundup's leaders, the Micron TransPort and the NEC Versa. The lithium ion battery's BatteryMark performance was 2 hours and 47 minutes, only 4 minutes less than that of the 233-MHz machine.

Direct price: $3,599 (32MB), $3,899 (64MB)
Dell Computer Corp., Round Rock, TX; 800-388-8542, 512-338-4400
www.dell.com
Choose 411 at www.pcmag.com/infolink.

Though the machine is priced well below the competition, the Dell Inspiron is just as adept and—in some cases—a preferable option.

Gateway 2000 Inc.

Gateway Solo 9100 Multimedia Notebook

Representing a significant improvement over the 233-MHz Solo 9100, the new 266-MHz model—packed with a faster processor, graphics chip set, display, and 20X max CD-ROM drive—sells for $5,079 with 32MB of SDRAM memory.

Rather than price this efficient machine to compete with the 266-MHz offering from Dell, Gateway has bundled it with a collection of pertinent peripherals and set its price closer to that of the typical high-end portable.

Weighing in at just over 9 pounds with AC adapter, the Solo 9100 measures 2.2-inches thick. In addition to storing the battery, the front of the machine houses the multifunction bay, which accepts either Gateway's dual media module that incorporates a 20X max CD-ROM and a floppy disk drive (making the Solo 9100 the only machine reviewed here to offer simultaneous internal use of a CD-ROM, a floppy disk drive, and a battery) or an optional $199 second battery. Between this bay and the primary battery bay is a door for accessing the 3.9GB hard disk. The display measures 14.1 inches, and a new graphics subsystem—a Chips and Technologies upgrade featuring 4MB of EDO DRAM graphics memory—supports both a partial-screen 800-by-600 resolution at 24-bit color and a full-screen 1,024-by-758 at 16-bit color.

At the rear of the machine is the typical array of I/O ports (docking station, parallel, serial, VGA-out, and PS/2) and audio jacks (line-in, line-out, speaker-out/headphone, and mic), along with a joystick/MIDI port, composite video-in, composite video-out, and Fast IR.

One side panel offers two USB ports (all other systems reviewed here have only one), while the other has two PC Card slots (one with Zoomed Video support). A pair of stereo speakers resides just beneath the Solo 9100 keyboard on either side of an ample palm rest.

One convenience on the functional keyboard is the "Status"

function key, which launches a small on-screen window detailing the amount of remaining battery life, Power Management usage, AC power usage, and the current BIOS version.

CD-ROM WinMark performance rose by 17 percent, while CPUmark, Disk WinMark, and Winstone rose between 5 and 7 percent. On the whole, the results were average relative to the 266-MHz competition, save the lithium ion battery's exceptional BatteryMark time of 4 hours and 13 minutes. The Solo 9100 also supports battery warm-swapping.

Gateway packages a number of amenities with the Solo 9100: an x2 PC Card modem, an external battery recharger, and a 2.1-pound port replicator. With its 4-hour battery life, dual CD/floppy disk module, and host of accessories, the Solo 9100 is a desktop replacement with an undeniable knack for the road.

Hitachi PC Corp.

Hitachi VisionBook Pro

Connectivity is the hook for the VisionBook Pro, Hitachi's 266-MHz desktop replacement notebook. This 7.4-pound system, which sells for $5,300 (street price) with 32MB of EDO DRAM, features both a cellular-ready x2 modem and an integrated Fast Ethernet adapter. Still, the system falls short of the other notebook offerings in this roundup.

Direct price: $5,079 (32MB), $5,279 (64MB)

Gateway 2000 Inc., N. Sioux City, SD; 800-315-2536, 605 232 2000

www.gateway.com

Choose 412 at www.pcmag.com/infolink.

The VisionBook's chassis provides simultaneous internal use of the CD and floppy disk drives (although it does not let you use the CD, floppy disk drive, and battery all at once). The front of the machine incorporates two multifunction modular bays. The first bay accepts a battery or a floppy disk drive, and the second accepts a battery or a 20X max CD-ROM. A different battery cradle is required for each bay; nevertheless, you do have the option of using two batteries at once (a second battery costs $180). The hard disk is easily accessible via a catch-release on the underside of the system.

Hitachi VisionBook Pro

Street price: $5,300 (32MB), $5,430 (64MB)

Hitachi PC Corp., Milpitas, CA, 800-555-6820, 408 321-5216

www.hitachipc.com

Choose 413 at www.pcmag.com/infolink.

The VisionBook's left flank integrates both an RJ-45 and cellular connection to the internal 56K modem and an RJ-45 port for the Fast Ethernet adapter. The right side houses two Type II PC Card slots with Zoomed Video support, a Fast IR port, a headphone jack, line-out jack, and a USB port. The unit has the standard set of I/O ports (serial, parallel, VGA, and docking station), and a retractable door covers a docking station connector.

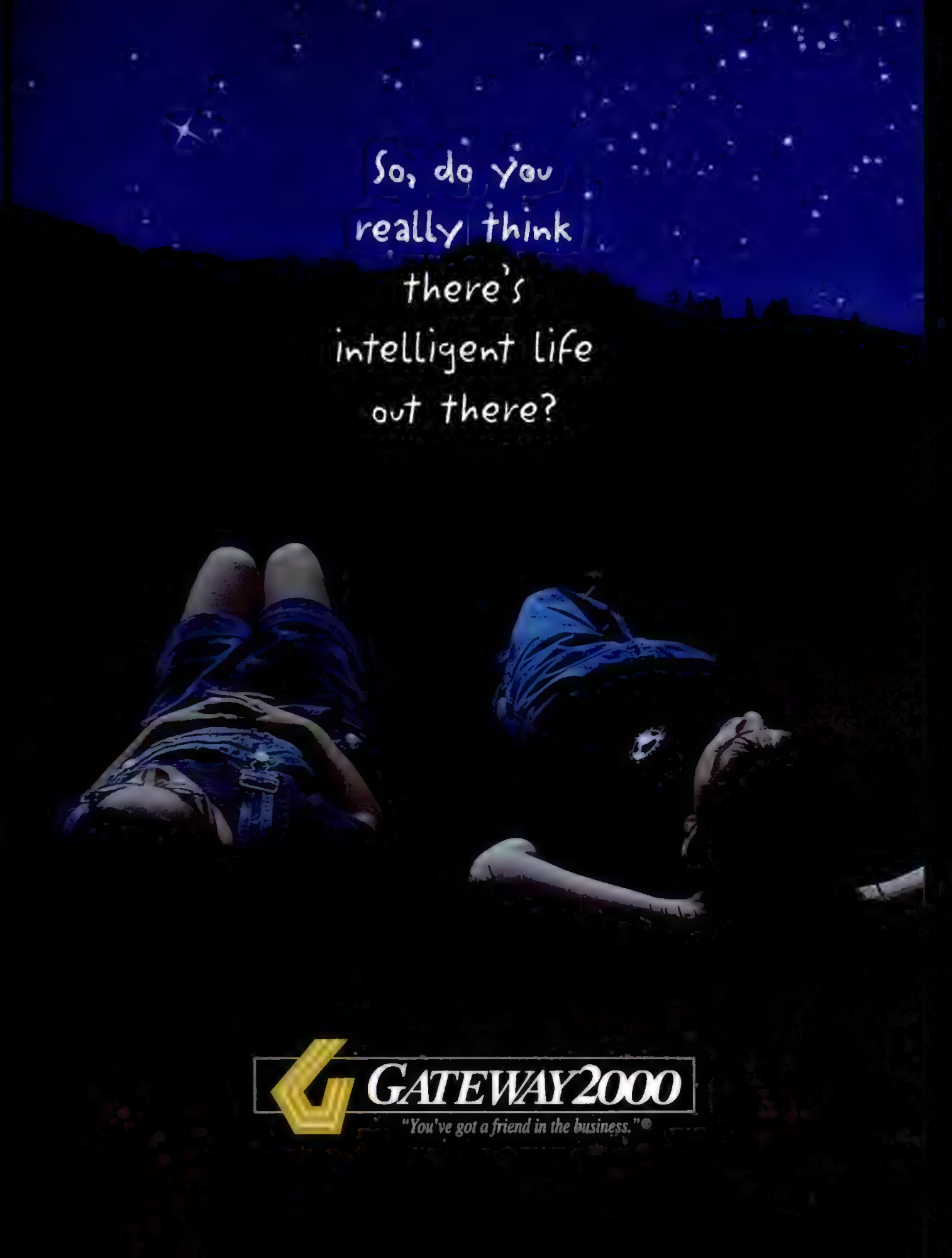
As with most of the systems reviewed here, the VisionBook has a 13.3-inch XGA display. The display is capable of full-screen 800-by-600 resolution at 24-bit color and partial-screen 1,024-by-768 at 16-bit color. We found the touch pad to be unresponsive to stimulus along its extreme right side or extreme left.

We encountered a few difficulties with the unit we tested at PC Labs. One of the multifunction bays stopped recognizing its battery after our first BatteryMark run was completed. With a single battery installed, the machine lasted for only 2 hours and 2 minutes on our BatteryMark test, the shortest time in this roundup. We also had trouble with the notebook's power management. When revived from "Suspend" mode, the operating system would inevitably seize up so completely that we could resume nor-

SUMMARY OF FEATURES

266-MHz Pentium MMX Notebooks

	Akia Tornado TX266	Dell Inspiron 3000 M266XT	Gateway Solo 9100 Multimedia Notebook	Hitachi VisionBook Pro	Micron TransPort XKE 266	NEC Versa 6260
Price of tested configuration. 32MB RAM / 64MB RAM	$4,100 / $4,299 direct	$3,599 / $3 899 direct	$5,079 / $5,279 direct	$5,300 / $5,430 street	$4,740 / $4,999 direct	$4,299 / $4,399 direct
System weight/Travel weight (pounds)	6.0 / 6 9	6.8 / 7 6	8 3 / 9 2	7 4 / 8 2	8 4 / 9.3	7 9 / 8 7
Maximum system RAM	128MB EDO DRAM	144MB SDRAM	192MB SDRAM	144MB EDO DRAM	192MB EDO RAM	128MB EDO DRAM
LCD panel size, type, and resolution	13.3" TFT XGA	13.3" TFT XGA	14.1" TFT XGA	13.3" TFT XGA	13 3" TFT XGA	13.3" TFT XGA
Graphics chip set	NeoMagic NM2160	NeoMagic NM2160	C & T 65555	C & T 65555	NeoMagic NM2160	NeoMagic NM2160
Graphics RAM and type	2MB VRAM	2MB VRAM	4MB EDO DRAM	2MB EDO DRAM	2MB VRAM	2MB VRAM
Hard disk capacity	4GB	4GB	3 9GB	4GB	7 8GB	3 1GB
Modem manufacturer	Boca Research	3Com	Gateway	Motorola	U S Robotics	U S Robotics
Type	PC Card	PC Card	PC Card	Internal	Internal	PC Card
Data/fax speeds in Kbps	56 6/14 4 (K56flex)	56 6/14 4 (x2)	33 6/14 4	56 6/14 4 (K56flex)	56 6/14 4 (x2)	56 6/14 4 (x2)
List price	$149	$149	Included	Included	Included	$159
Standard warranty on parts/labor (years)	1 / 1	1 / 1	1 / 1	3 / 3	CPU, RAM, 5; other parts, 1 / 1	3 / 3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really think
there's
intelligent life
out there?
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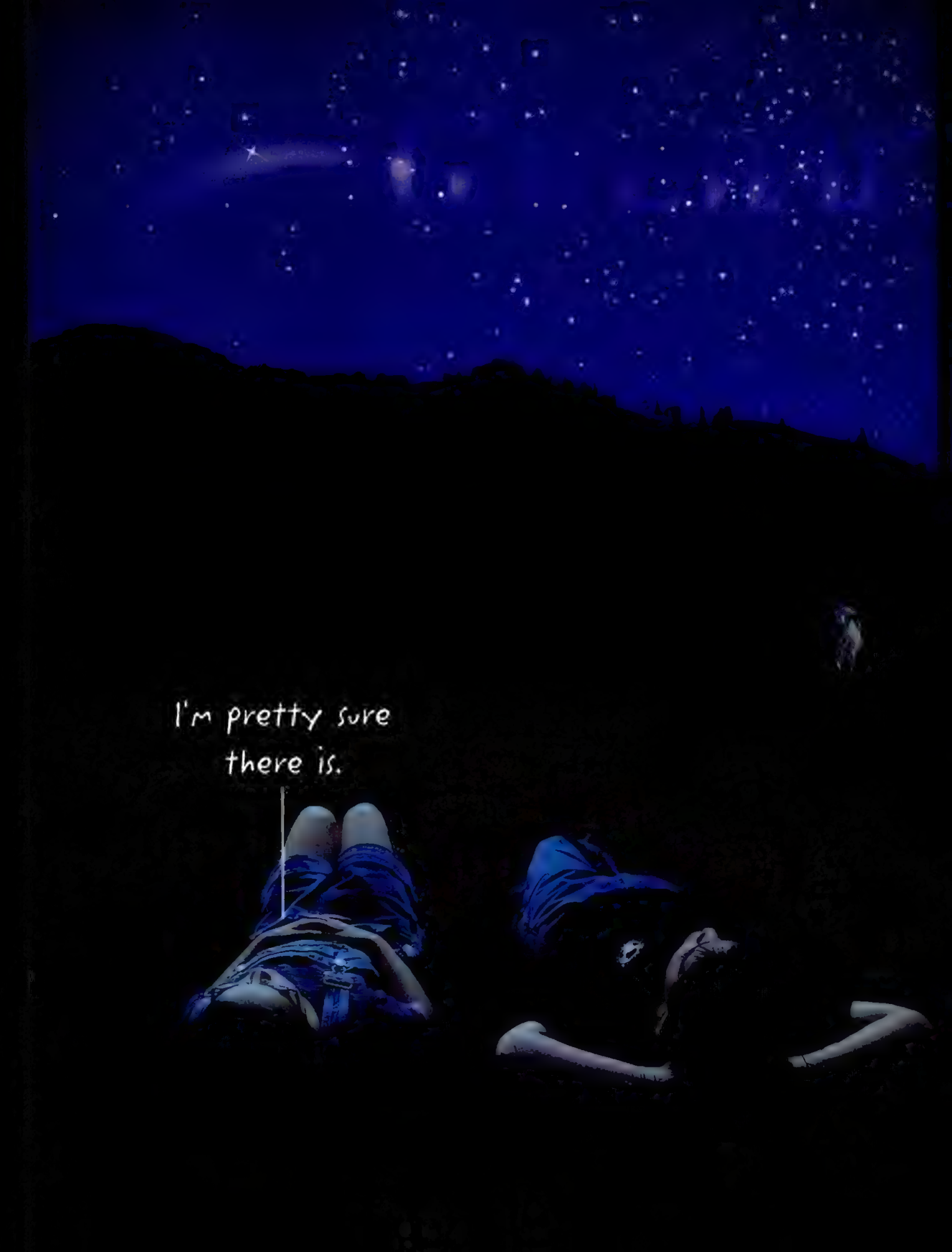
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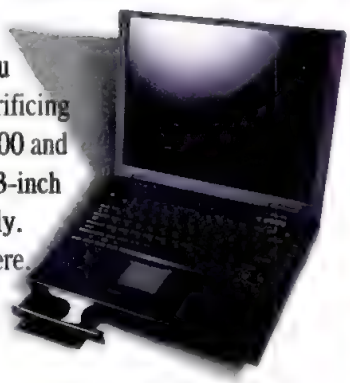

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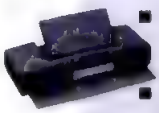

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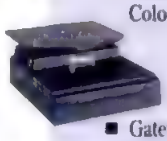

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- Microsoft® Windows® 95
- ▸ **Microsoft Choice Software**
- Gateway Gold℠ Service & Support• for DMCs

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(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- harman/kardon® High-Fidelity Sound System Upgrade $250
- Hewlett®-Packard ScanJet 5Pse Color Scanner $299
- 31-inch SVGA Color Monitor $699
- Learning 2000 Software Call for pricing

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- Intel® 233MHz **Pentium® II** Processor with 512K ECC Cache
- SMP-Compliant (Dual-Processor Ready) Supporting Up To Two Pentium II Processors (upgradable to 266MHz and 300MHz)
- 32MB EDO Memory (expandable to 512MB)
- ECC Memory System
- 4GB Ultra Wide SCSI-3 5,400 RPM Hard Drive
- Integrated Ultra Wide SCSI-3 Controller
- 12X SCSI CD-ROM Drive & 3.5" Diskette Drive
- 3Com® 10/100 Twisted Pair Ethernet Adapter
- Three 32-Bit PCI, Two EISA, One PCI/EISA Slots
- 4 DIMM Slots
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- Integrated 32-Bit PCI Graphics with 2MB DRAM
- Seven-Bay NS-7000 Server Tower Case with 325-Watt Power Supply, Includes five External Bays (three 5.25" and two 3.5") and two 3.5" Internal Bays
- 104+ Keyboard & Mouse
- Microsoft® Windows NT® Server 4.0 (1-4 CPUs, 10 User Licenses)
- ALR InforManager™ Server Management System with ActiveCPR™ Processor Protection

$3559 Gateway GoldValue Lease† $125/mo.

NS-8002

- Intel 233MHz **Pentium II** Processor with 512K ECC Cache
- SMP-Compliant (Dual-Processor Ready) Supporting Up To Two Pentium II Processors (upgradable to 266MHz and 300MHz)
- 64MB EDO Memory (expandable to 512MB)
- ECC Memory System
- 4GB Ultra Wide SCSI-3 5,400 RPM Hard Drive
- Integrated Ultra Wide SCSI-3 Controller
- 12X SCSI CD-ROM Drive & 3.5" Diskette Drive
- 3Com 10/100 Twisted Pair Ethernet Adapter
- Four 32-Bit PCI, One EISA, Two PCI/EISA Slots
- 4 DIMM Slots
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- Integrated 32-Bit PCI Graphics with 2MB DRAM
- 13-Bay NS-8000 Server Tower Case with 325-Watt Power Supply, Includes five External Bays (three 5.25" and two 3.5") and two 3.5" Internal Bays
- 104+ Keyboard & Mouse
- MS® Windows NT Server 4.0 (1-4 CPUs, 10 User Licenses)
- ALR InforManager Server Management System with ActiveCPR Processor Protection

$4659 Gateway GoldValue Lease† $163/mo.

Gateway GP-Series PC

GP5-166E

- Intel 166MHz Pentium Processor with MMX™ Technology
- 16MB SDRAM
- 256K Pipelined Burst Cache
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- Integrated PCI Video with 2MB DRAM
- 2GB 11ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive & 3.5" Diskette Drive
- Integrated 16-Bit Business Audio
- Integrated 10/100 Ethernet Twisted Pair Adapter
- Low Profile Desktop Case
- 104+ Keyboard & Mouse
- MS Windows® 95 & MS Office 97, Small Business Edition plus Bookshelf® 98
- Intel LANDesk® Client Manager 3.01
- Desktop Management Interface (DMI) 1.1 Compliant
- Gateway Gold℠ Service & Support for GP-Series PCs

$1249 Gateway GoldValue Lease† $45/mo.

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Desktops

- 3Com PCI 10/100 TP Ethernet Adapter **$64**
- 16-Bit Token Ring Adapter **$159**
- MS Windows NT Workstation 4.0 **$99** *(upgrade from PCs with MS Windows 95)*

Servers

- 3-Channel ADAC RAID Card **$1130**
- 3-Drive RAID Cage **$100** *(requires 3-Channel ADAC RAID Card)*
- Three 4.2GB SCSI SCA Drives **$1955** *(requires 3-Drive RAID Cage)*
- ADAC RAID Memory Upgrades *(Call for pricing.)*
- 2nd Pentium II 233MHz Processor with 512K ECC Cache **$730**

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The Gateway GP-Series PC line was named Computer Shopper *1997 Best Value Desktop PC!*

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- Intel® 166MHz Pentium® Processor with MMX™ Technology
- 32MB SDRAM
- 512K Pipelined Burst Cache
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- 2MB 3-D 64-Bit PCI Graphics
- 2GB 11ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Desktop Case
- 104+ Keyboard & MS® IntelliMouse™
- Microsoft® Windows® 95 & MS Office 97, Small Business Edition plus Bookshelf® 98
- Gateway Gold™ Service & Support for GP-Series PCs

$1299 Gateway GoldValue Lease† $46/mo.

GP6-233

- Intel 233MHz Pentium II Processor with 512K Cache
- 64MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- 8MB 3-D AGP Graphics
- 4GB 11ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104+ Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 98
- Gateway Gold Service & Support for GP-Series PCs

$1999 Gateway GoldValue Lease† $71/mo.

Gateway GP6-233, PC World *Power Desktop, October 1997*

GP6-266

- Intel 266MHz Pentium II Processor with 512K Cache
- 64MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- 8MB 3-D AGP Graphics
- 6.4GB 10ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104+ Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 98
- Gateway Gold Service & Support for GP-Series PCs

$2349 Gateway GoldValue Lease† $83/mo.

GP6-300 BEST BUY

- Intel 300MHz Pentium II Processor with 512K Cache
- 64MB SDRAM
- **EV900 .26 Screen Pitch 19" Monitor** (18" viewable)
- 8MB 3-D AGP Graphics
- 8.4GB 8.5ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104+ Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 98
- Gateway Gold Service & Support for GP-Series PCs

$2899 Gateway GoldValue Lease† $103/mo.

Gateway Extras

(Only available to new or existing Gateway customers or with the purchase of a PC.)

- 3Com® PCI 10/100 TP Ethernet Adapter **$64**
- TelePath® Modem *for Windows,* with x2™ Technology** **$79**
- MS Windows NT® Workstation 4.0 **$99** *(upgrade from PCs with MS Windows 95)*
- Iomega® Internal ZIP™ Drive with Two Discs **$99**
- TR4 IDE 4GB Tape Backup Unit wih Tape **$199**
- Hewlett®-Packard OfficeJet 600 **$599**

Extra memory can take your GP-Series PC performance straight to the stars!
(Tests conducted on GP-series professional PC with the MS Windows NT® 4.0 operating system.)

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Once you've decided on your custom-built PC, get ready to customize software too. Many G-Series multimedia systems come with exclusive Microsoft Choice software — so you can choose the software that's right for you. And we're taking education to the next level with Learning 2000, a self-paced program that helps kids from fifth grade to college level reach for the stars in reading, writing, math, algebra and more.

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- 512K Pipelined Burst Cache
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- 2MB 3-D 64-Bit PCI Graphics
- 2GB 11ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- Ensoniq® Wavetable Audio
- Altec Lansing® ACS-41 Speakers
- TelePath® Modem *for Windows* with x2™ Technology**
- G-Series Desktop Case
- MultiFunction Keyboard & Mouse
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- Gateway Gold℠ Service & Support for G-Series PCs

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- Intel 233MHz **Pentium II** Processor with 512K Cache
- 32MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- **nVidia™ 4MB 3-D AGP Graphics**
- 4GB 11ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- Altec Lansing ACS-41 Speakers
- TelePath Modem *for Windows*, with x2 Technology**
- G-Series Mid-Tower Case
- MultiFunction Keyboard & Mouse
- MS® Windows 95
- **Microsoft Choice Software**
- Gateway Gold Service & Support for G-Series PCs

$1999 As low as* $70/mo.

PC World *Best Buy September 1997*

- Intel 266MHz **Pentium II** Processor with 512K Cache
- 32MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- **nVidia 4MB 3-D AGP Graphics**
- 6.4GB 10ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- Boston Acoustics® MicroMedia™ 3-Piece Speaker System
- TelePath Modem *for Windows*, with x2 Technology**
- G-Series Mid-Tower Case
- MultiFunction Keyboard & MS IntelliMouse™
- MS Windows 95
- **Microsoft Choice Software**
- Gateway Gold Service & Support for G-Series PCs

$2399 As low as* $84/mo.

- Intel 300MHz **Pentium II** Processor with 512K Cache
- 64MB SDRAM
- **EV900 .26 Screen Pitch 19" Monitor** (18" viewable)
- **nVidia 4MB 3-D AGP Graphics**
- 6.4GB 10ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- Boston Acoustics MicroMedia 3-Piece Speaker System
- TelePath Modem *for Windows* with x2 Technology**
- G-Series Mid-Tower Case
- MultiFunction Keyboard & MS IntelliMouse
- MS Windows 95
- **Microsoft Choice Software**
- Gateway Gold Service & Support for G-Series PCs

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- Intel 300MHz **Pentium II** Processor with 512K Cache
- 128MB SDRAM
- **EV900 .26 Screen Pitch 19" Monitor** (18" viewable)
- **nVidia 4MB 3-D AGP Graphics**
- TV/FM Tuner Card
- 9GB 8.2ms 10K RPM Ultra-Wide SCSI-3 Hard Drive
- **DVD-ROM Drive & DVD Decoder Card**
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- **Boston Acoustics MediaTheater™ 3-Piece Speaker System**
- TelePath Modem *for Windows* with x2 Technology**
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- MultiFunction Keyboard & MS IntelliMouse
- MS Windows 95
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- Gateway Gold Service & Support for G-Series PCs

$4399 As low as* $153/mo.

Gateway Extras

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- **EV900 .26 Screen Pitch 19" Monitor** (18" viewable)
  - upgrade from EV500 **$400**
  - upgrade from EV700 **$200**
- **Gateway Gold Pemium Service and Support** — an extended Three-Year On-Site Agreement†† including priority 800 number for access to technical experts.
  - At time of system purchase **$99**
  - Within current on-site service agreement **$129**

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(Tests conducted on G-series multimedia system with the MS Windows 95 operating system.)

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Gateway G-Series Multimedia PC

G6-233 BEST BUY

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- 32MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- **nVidia™ 4MB 3-D AGP Graphics**
- 4GB 11ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- Ensoniq® Wavetable Audio
- Altec Lansing® ACS-41 Speakers
- TelePath® Modem *for Windows*, with x2™ Technology**
- G-Series Mid-Tower Case
- MultiFunction Keyboard & Mouse
- Microsoft® Windows® 95
- **Microsoft Choice Software**
- Gateway Gold℠ Service & Support for G-Series PCs

$1999 As low as* $70/mo.

Gateway GP-Series Professional PC

GP6-300 BEST BUY

- Intel 300MHz **Pentium II** Processor with 512K Cache
- 64MB SDRAM
- **EV900 .26 Screen Pitch 19" Monitor** (18" viewable)
- 8MB 3-D AGP Graphics
- 8.4GB 8.5ms Ultra ATA Hard Drive
- 13X min/32X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104+ Keyboard & MS IntelliMouse™
- MS® Windows 95 & MS Office 97, Small Business Edition plus Bookshelf® 98
- Gateway Gold Service & Support for GP-Series PCs

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D5-200 BEST BUY

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- 32MB SDRAM
- 512K Pipelined Burst Cache
- Destination 31" SVGA Monitor
- 2MB Graphics Accelerator with Cable-Ready TV Tuner
- 4GB 11ms Ultra ATA Hard Drive
- **DVD-ROM Drive & DVD Decoder Card**
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- **Boston Acoustics® MicroMedia™ 3-Piece Speaker System**
- TelePath Modem *for Windows*, with x2 Technology**
- 7-Bay Charcoal-Colored PC Case
- Cordless Keyboard w/ Integrated EZ Pad® Pointing Device
- Cordless Field Mouse® Remote
- MS Windows 95
- **Microsoft Choice Software**
- Gateway Gold Service & Support• for DMCs

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- 4MB EDO Video RAM
- **Removable Combo 8X min/20X max CD-ROM & 3.5" Diskette Drive**
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- External Battery Charger
- USB Ports, CardBus & Zoomed Video Support
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- Deluxe Leather Carrying Case
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If your system comes standard with Microsoft Choice software, that means you'll receive all six titles in our popular Microsoft Home Essentials software bundle *plus* one of these three great packages:

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- **Microsoft Action Titles** (also available as an upgrade for $99) Close Combat™; Flight Simulator; Age of Empires™; Monster Truck Madness™; DreamWorks Interactive: DILBERT'S™ Desktop Games and DreamWorks Interactive: The Neverhood™.
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- **Family Reference Bundle** Includes Grolier Multimedia Encyclopedia®; Mindscape's® World Atlas 6.0; Rand McNally TripMaker™; National Geographic® Swinging Safari Really Wild Animals™ and Mayo Clinic® Family Health. **$79**
- **Gamer's Pack** Includes DeadLock™; Jack Nicklaus® 4; Super Bubsy®; Sega Rally™ Championship; Mixman 3-Mix™ and PC ProPad gaming device. **$99**
- **Kid's BackPack™ 98** Includes Barbie™ Magic Fairy Tales™ Barbie as Rapunzel; Highlights® Hidden Pictures™ Workshop; Wishbone™ and the Amazing Odyssey; Kids Count™ Jack's House™; Kids Count Jack's Attic™; CTW/Sesame Street® Elmo's Preschool; Twinsen's Odyssey™ and cow-spotted backpack. **$99**
- **Education Bundle Grades K-3** Includes Reader Rabbit® 1; Math Rabbit®; Let's Start Learning!™; Interactive Math Journey®; Reader Rabbit's Interactive Reading Journey® 1; Paint, Write & Play!™ and Ultimate Children's Encyclopedia™. **$99**
- **Education Bundle Grades 4-8** Includes Super Solvers® Gizmos & Gadgets!®; Super Solvers OutNumbered!®; Student Writing Center®; Logic Quest™; The Oregon Trail® and Ultimate Writing & Creativity Center®. **$99**

Extras

(Available to existing Gateway customers or with system purchase.)

- Kensington Master Lock® Cable **$39**
- Microsoft SideWinder® Joystick **$59**
- Starter Kit **$59** *(wrist rest, APC® surge protector, CD wipes, monitor wipes, 10 formatted 3.5" diskettes, diskette/CD box and keyboard cover)*
- Comfy Keyboard (for kids) **$99**
- Microsoft SideWinder Force Feedback Pro Joystick plus Tigershark™ — 2060A.D., Interstate 76 and MDK: Mission Laguna Beach™ **$139**
- Visioneer® 3000 Color Scanner **$179** *(Includes $50 rebate offer)*
- PalmPilot™ Personal Data Organizer **$249**
- Hewlett®-Packard ScanJet 5Pse Color Scanner **$299**
- APC Back-UPS Office **$119**
- APC Back-UPS Pro 650 **$319**

Printers & More

(Each printer includes cable and ink cartridge.)

- Canon® BJC®-250 Color Bubble Jet Printer **$149**
- Epson® Stylus® COLOR 400 Ink Jet Printer **$199**
- Hewlett-Packard DeskJet 694C Color Printer **$269**
- Epson Stylus COLOR 600 Ink Jet Printer **$269**
- Hewlett-Packard LaserJet 6Lse Laser Printer **$399**
- Epson Stylus COLOR 800 Ink Jet Printer **$399**
- Hewlett-Packard LaserJet 6Pse Laser Printer **$799**

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- **Gateway GoldValue Lease** – This convenient leasing program is available to qualified commercial customers, and arranged by independent leasing companies with 36-month payment terms. Lease terms are subject to change without notice or obligation.

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U.S. Robotics X2 TECHNOLOGY

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mal operations only by disconnecting both the battery and the AC adapter.

On all of the other benchmark tests, this 266-MHz system showed improvement over its 233-MHz sibling, with CD-ROM and Disk WinMark test scores that jumped 16 percent and CPUmark and Winstone test scores that rose nearly 10 percent. Graphics WinMark performance rose 8 percent, but it was still well below average and the worst showing of the roundup.

With its integrated Ethernet support, the Hitachi VisionBook Pro can certainly find a niche market, but we found it a disappointing machine that was also too expensive.

Micron Electronics

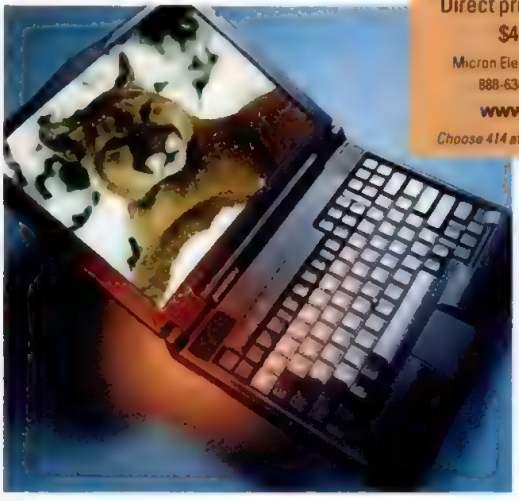
Micron TransPort XKE 266

PC MAGAZINE EDITORS' CHOICE

The latest notebook from Micron Electronics is the leading performer among our collection of 266-MHz portables. It also receives our Editors' Choice.

The Micron TransPort XKE 266 makes no compromises. The system—which sells for a direct price of $4,740 with 32MB of EDO DRAM and $4,999 with 64MB—comes with a 7.8GB UltraATA hard disk, a 13.3-inch XGA screen, and an integrated, cellular-ready 56K modem.

Housed in the front modular bay, the 20X max CD-ROM drive comes equipped with a host of external audio CD controls that are operational only when headphones are plugged into the jack provided; these controls include a volume wheel along with play, forward, backward, and stop buttons. The CD-ROM module can be swapped out for a battery or second hard disk, while a second, adjacent bay accepts either a battery or a standard floppy disk drive. Two Type II PC Card slots with Zoomed Video support are to be found on the left-hand side of the system. In addition, batteries are capable of being warm-swapped when the machine is in its "Suspend" mode.



Direct price: $4,740 (32MB), $4,999 (64MB)

Micron Electronics Inc., Nampa, ID, 888-634-8799, 208-898-3343

www.micronpc.com

Choose 414 at www.pcmag.com/infolink.

The number of I/O options—all of which are clearly labeled—are daunting. On the right side of the machine, you will notice an integrated RJ-45 connection to an internal telephony modem, a cell phone connection to that modem, a joystick/midi port, a composite video-out port, and an S-Video-out port. At the rear of the system, in addition to standard I/O ports, you will be able to find a Fast IR interface, microphone and headphone jacks, and dedicated mouse and keyboard ports. For additional convenience, a second FastIR port is located at the front of the system, and both an integrated pointing stick and a touch pad are provided for the user. Stereo speakers are to be found in the front of the display.

On our benchmark tests, the TransPort XKE 266 led the competition in this roundup, posting the top scores for CD-ROM WinMark, Disk WinMark, and Winstone as well as the longest battery life as measured by the BatteryMark test. Although the 266-MHz TransPort was 10 percent slower under Disk WinMark than the previously reviewed 233-MHz TransPort (albeit with a significantly larger disk), all other benchmark scores showed at least a 10 percent improvement. Winstone performance was this roundup's best and the highest we have seen yet from an *x*86 portable. In addition, battery life jumped up to 4 hours and 29 minutes.

Micron ships the TransPort XKE 266 with two headsets, a Radio Frequency suppressor for eliminating interference from the CD-ROM headphone jack, and an Antenna for use with AirMedia Live's wireless Internet service.

Providing remarkably high performance and some wonderful versatility at a $4,740 direct price, the Micron TransPort XKE 266 is our Editors' Choice winner.

USABILITY

	Akia Tornado TX266	Dell Inspiron 3000 M266XT	Gateway Solo 9100 Multimedia Notebook	Hitachi VisionBook Pro	Micron TransPort XKE 266 (PC MAGAZINE EDITORS' CHOICE)	NEC Versa 6260
Keyboard	Fair	Excellent	Good	Good	Good	Excellent
Pointing device	Fair	Good	Good	Fair	Excellent	Good
Chassis design	Good	Good	Excellent	Good	Excellent	Excellent
Battery and power management	Good	Fair	Good	Poor	Good	Good
Upgradability	Fair	Good	Excellent	Excellent	Good	Fair
Internal/external display capabilities	Good	Good	Excellent	Good	Good	Good
USB support	Poor	Poor	Good	Good	Good	Good

Here, we evaluate the relative quality of these 266-MHz portables in seven different categories. Within each category, a machine receives a rating based on its ability to complete a series of brief tasks. A machine, after all, is not judged by benchmark test results alone. **Keyboard** ratings reflect not only material soundness and key placement but—subjectively—the overall typing experience. We judge a machine's **pointing device** or pointing devices on physical placement, responsiveness, and accuracy. Under **chassis design**, we scrutinize the general durability of each system's casing and the efficacy of its external components. We also rate **battery and power management** options, then check the **upgradability** of memory subsystems and primary hard disks. We examine the graphical **internal/external display capabilities** and check **USB support** by installing a common USB camera on each unit.

NEC Computer Systems Division

NEC Versa 6260

Direct price: $4,299 (32MB), $4,399 (64MB)

NEC Computer Systems Division, Boxborough, MA, 888-862-3669, 508-264-8000

www.necnow.com

Choose 415 at www.pcmag.com/infolink.

The first 266-MHz portable from NEC, the Versa 6260 ($4,299 direct price) is designed with the demands of the power user in mind. The system is distinguished by its inclusion of the market's finest and most versatile modular bay.

At any given time, the VersaBay II can accommodate a 20X max CD-ROM, a standard floppy disk drive, a secondary battery ($189), a secondary hard disk ($1349 for a 5GB model), a Zip drive ($299), or an LS-120 drive ($199).

Weighing 7.9 pounds and measuring 2.2-inches thick, the NEC Versa 6260 features a 3.1GB hard disk, a 13.3-inch XGA display, two stereo speakers, a touch pad, and a solid keyboard. The left panel of the rigid Versa chassis holds the system's primary battery. The VersaBay II sits in the middle of the chassis' front panel. Although the machine we tested did not allow for the hot-swapping of VersaBay modules, NEC plans to offer such support in the immediate future for all modules except the second battery (which, like the primary battery, may be only warm-swapped).

Audio jacks (line-in, line-out, headphone, and mic) and two Type II PC Card slots with Zoomed Video support reside on the left of the machine, while USB and video-out ports are on the right. A Fast IR port sits beside the VersaBay, and other standard I/O (serial, parallel, VGA, and docking station) are integrated into the rear. The Versa's hard disk can be replaced by removing a screw, but memory expansion is more awkward: You must first remove the screws securing the cover on the system's speakers and then lift up the keyboard.

The Versa 6260's benchmark performance was second only to that of the Micron TransPort XKE 266. The Disk WinMark scores went down slightly from the 233-MHz model, due to a change in hard disk size and manufacturer. Similarly, BatteryMark performance also went down from 2 hours and 39 minutes to 2 hours and 20 minutes. Nonetheless, all other scores increased. The system's NeoMagic 128XD graphics subsystem, equipped with 2MB of VRAM, was largely responsible for the leading Graphics WinMark score and a Winstone score that was only marginally less than that of the TransPort. The Versa 6260 also offers DMI 2.0 compliance and preloaded applications such as Intel's LANDesk Client Manager. If you want to expand further, you can choose from three port replicators/docking stations ranging in price from $199 to $799.

With any of its options included, the Versa 6260 can quickly become an expensive system, but its base price rivals that of any machine in this roundup. For those desiring extensive storage options and manageability, this is the ideal corporate portable. PC

Around the Corner: Toshiba's Tecra 550CDT

Market leader Toshiba America Information Systems' Tecra 550CDT is a bit of an anomaly when compared with the notebooks in this roundup. It is the only machine not to use Intel's Mobile Module, opting instead for Toshiba's own Symphony 3 chip set. Representing Toshiba's mainstream corporate line, the $3,950 550CDT—which was not ready in time to be included in this roundup—is a utilitarian corporate machine that's equipped with an internal cellular-ready modem and Intel's LANDesk Client Manager.

Weighing only 6.2 pounds and measuring only 1.85 inches thick, the familiar light-grey Tecra chassis incorporates a 12.3-inch XGA display, an average keyboard, and a pointing stick.

The machine's modular bay is more accommodating than most, accepting a 20X max CD-ROM, a floppy disk drive, a second 2GB hard disk ($600), or a second battery ($270). The floppy disk drive can also be used externally in conjunction with the provided plastic cradle and dedicated port connection.

Installing a new hard disk is not quite as simple. The door covering the primary 3.8GB hard disk is fastened by a pair of Phillips-head screws, and the disk itself can be removed only after you unfasten the cable. Upgrading memory is also accomplished by first removing two screws.

The Tecra 550CDT offers the benefits of a cellular-ready internal 56K modem. A RJ-45 jack and a cellular phone jack are on the system's right-hand side next to the modular bay. At the rear of the machine, of course, are standard I/O (serial, parallel, VGA, and docking) and audio jacks (mic, headphone, and speaker-out).

Toshiba has integrated a single USB port and front and rear Fast IR ports for use with a bundled copy of Puma TranXit. But when we installed a common USB camera, Windows 95 posted several error messages saying that it was missing a particular driver file.

In consideration of its corporate market, the unit is compliant with DMI 2.0 and has Intel's LANDesk Client Manager.—*CM*

Toshiba Tecra 750CDT. Street price: $3,950 (32MB), $4,300 (64MB). Toshiba America Information Systems Inc., Irvine, CA; 800-334-3445; www.computers.toshiba.com. *Choose 416 at www.pcmag.com/infolink.*

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E-MAIL SOFTWARE

Speak my Language

E Corp's email 97 combines a full-featured e-mail package with a six-language translator.

By Greg Alwang

Helping to remove the language barriers between companies doing business internationally, E Corp's email 97, Version 1.4 ($59.97 list), integrates the translation of six languages within a comprehensive message-management system. email 97 goes well beyond messaging basics and includes support for encryption, rich-text messages, advanced message filtering, multiple e-mail accounts, and two-way paging.

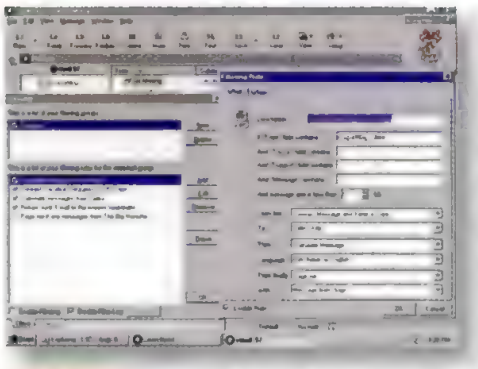
Message translation for English, German, Italian, French, Spanish, and Portuguese is done manually for incoming and outgoing mail or automatically for incoming mail meeting certain criteria. As with any electronic translator, peculiar wording can result in confusing messages, so it's best to stick with simple terminology to get your point across.

E Corp has teamed up with Pretty Good Privacy to integrate PGP 128-bit encryption into email 97. email 97 also supports the vCard and vCalendar standards for platform-independent exchange of business-card and scheduling information.

Using a form of artificial intelligence, E Corp's eTelligence technology monitors user activity for repeated tasks and creates wizards that duplicate these operations. For instance, if you manually convert all messages from an Italian customer into English and forward them to a colleague, email 97 will memorize these actions and save them as an icon. So the next time you get e-mail from this customer, you can simply click the icon to perform these steps.

Keeping up with the leading edge of messaging technology, email 97 lets you reduce message size and cost when sending messages to two-way pagers. Using a proprietary verbal compression algorithm, email 97 reduces messages to just the necessary phonetic components.

As e-mail volume increases, users need new methods of weeding through their messages. An email 97 wizard creates filters that can decipher the address, subject, body, and size of an incoming message and perform almost any email 97 function. You can turn filters on and off and even specify the times you want filters to be active.



WHO'S THERE? *Advanced filtering rules let you automate almost any task for incoming mail.*

email 97 supports multiple e-mail accounts and allows you to schedule how often it will check them. In addition, you can configure multiple dial-up locations, making it easy to check e-mail using different dialing properties.

email 97's integrated address book supports LDAP server searches and "whois" and "finger" commands. It also lets you import addresses from other e-mail systems, such as Eudora. The built-in calendar provides basic meeting and appointment scheduling.

email 97, Version 1.4. List price: $59.97 ($29.97 without language translator). Requires: Microsoft Windows 95 or NT, 8MB RAM, 25MB hard disk space, CD-ROM drive. E Corp., Pittsburgh, PA; 800-326-7748, fax: 412-920-1287; www.e-corp.com. *Choose 409 at www.pcmag.com/infolink.*

PERIPHERALS

It's Not Just Talk

GlobeWave's Com.plete PC Card lets you phone, fax, and transmit data from your notebook.

By Cade Metz

The cellular phone, once a leading status symbol, is now blasé. The modem, once an exotic toy for hackers and BBS lovers, is now a sidecar to almost every PC. Yet there's only one

modem with a built-in cell phone: GloveWave's Com.plete PC Card ($500 street)—a Type III device capable of data, fax, and voice communications over both a cellular network and land lines.

Installing the PC Card under Microsoft Windows 3.1, 95, or NT is as swift and simple as installing any other standard PC Card device. Using a pair of floppy disks loaded with drivers and operation software, you can configure the device and have it ready for land-line use after a few mouse clicks.

Setting up the device for cellular use requires a bit more doing but is also simple: Via the Activation software utility, you merely input the phone number and system ID of your cellular account, which is then stored on the Card.

The Com.plete PC Card has four separate modes of operation: cellular data, cellular voice, land-line voice, and land-line data. Switching among them involves merely changing the Card's external attachments. When initialized, the Card automatically switches to the appropriate mode based on the external accessories attached.

If you connect GlobeWave's pinkie-size antenna, the PC Card will operate as a cellular modem. If you attach the EarSet along with the antenna, the card operates as a cellular phone. And with the RJ-11 adapter and an analog phone line, the Card works as either a standard telephone (with the EarSet) or a standard modem (without the EarSet).

The EarSet operates like a full audio headset, but it fits unobtrusively into your ear. Connected to the Com.plete PC Card via a yard of wire, the EarSet has a miniature speaker and a microphone, allowing you to speak without concertedly directing your voice. Over cellular networks and land lines, sound quality is similar to that of a speakerphone.

Performance is not as impressive when the Card is transferring data. Rates are no higher than 14.4 Kbps over land lines and 9,600 bps over a cellular network. GlobeWave should have already released a faster version of the product by the time you read this.

Com.plete PC Card. Street price: $500. GlobeWave Inc., Rochelle Park, NJ; 201-843-7202, 888-262-8220; www.globewave.com. *Choose 408 at www.pcmag.com/infolink.*

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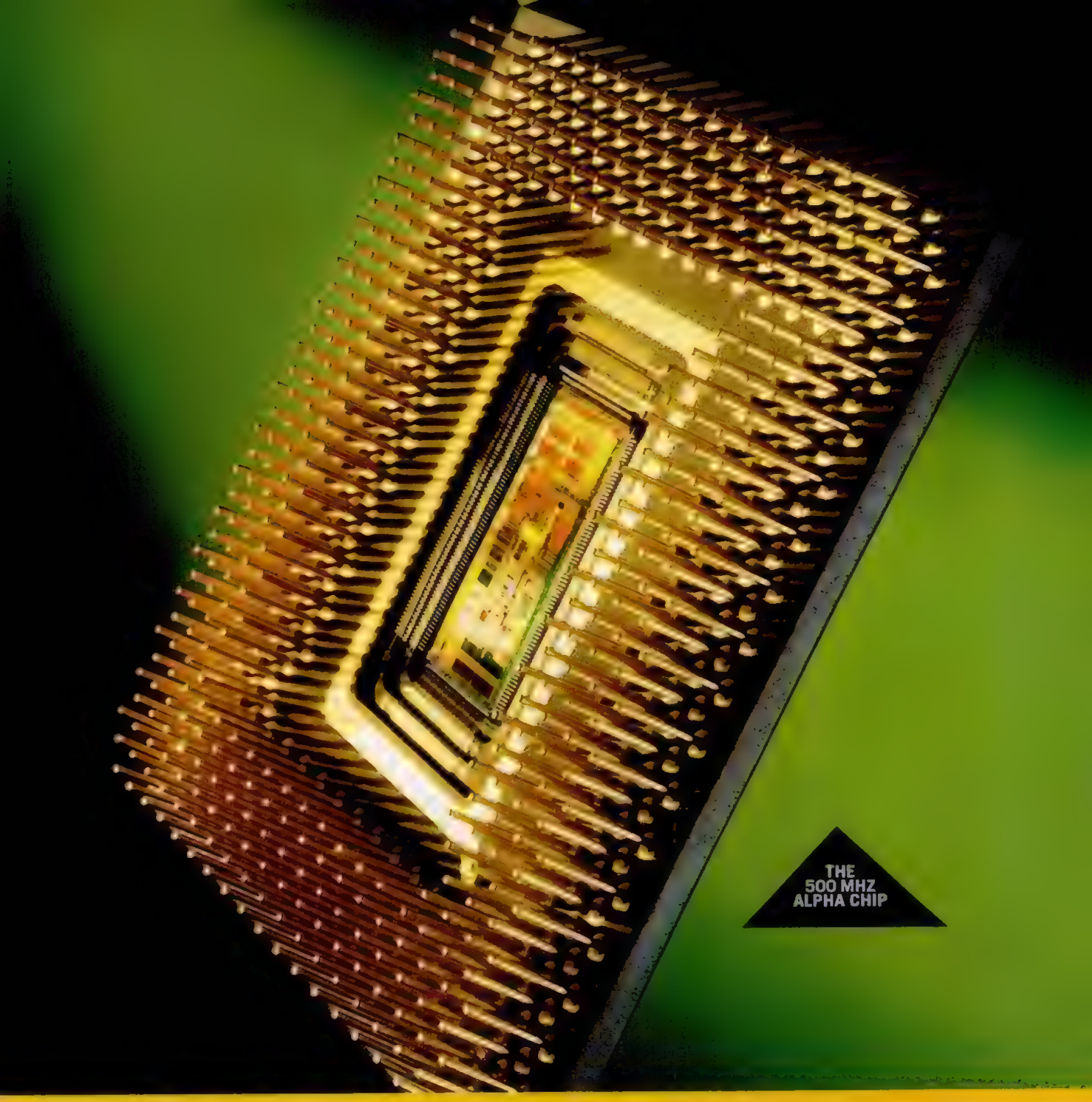

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NETWORK PRINTERS

The Fine Print

Two new network printers from Hewlett-Packard and Xerox take aim at different audiences.

By James Karney and Les Freed

If you're shopping around for a network printer, two big names are introducing new units that are sure to please their intended audiences. Hewlett-Packard has updated its LaserJet series with the 17-ppm (page-per-minute) 4000 series, which boasts better output quality and management features. Also, Xerox wants to turn your printer into a copier with its 32-ppm DocuPrint N32.

HP LASERJET 4000TN

Hewlett-Packard's new LaserJet 4000 series debuts as an improvement to the company's existing line of LaserJet 5 printers. Offering faster throughput, higher resolution, PostScript Level 2 emulation, and elegant management software, this new series is sure to make an attractive upgrade. The new models all feature 17-ppm, 1,200-dpi engines, 100-MHz RISC processors, and support for both PCL 5e and PCL 6.

The unit we tested for this review is the LaserJet 4000TN ($1,600 street price). Aimed at the workgroup, this printer comes with 8MB of RAM and a network interface card. It also features a 600-sheet basic input capacity (total storage expandable to 1,100 pages). The unit uses media ranging from 16- to 53-pound stock.

GETTING STARTED

Setting up the new printer as a remote device under NetWare was not fully automatic, but the JetAdmin 3.0 installer made short work of the task. It easily added a Novell printer queue based on our answers to prompts during the setup routine. The same was true for using the LaserJet 4000TN with a Microsoft Windows NT Server network under TCP/IP. Though you need some knowledge of networking, JetAdmin takes most of the pain away from printer installation.

HP has made some major improvements to its management software with a new graphical interface and a quick-set function for defining custom print jobs. Along with the complete and well-illustrated manual comes a clear quick-start guide and a sheet explaining how to unpack the hardware.

Right out of the box, the unit was fully operational on two servers (with five custom jobs and three groups) in less than 30 minutes. The virtual devices included special settings for resolution, media type, paper trays, paper size, and finishing.

WORKHORSE: *HP's LaserJet 4000TN goes after the workgroup with improved management features and faster printing.*

OUTPUT: *Print quality is excellent, with fine detail even in shadows.*

BETTER MANAGEMENT

The elegance of the LaserJet 4000 software goes beyond just configuring options. It can be used to maintain and troubleshoot any MIB-compliant printer on the network, regardless of platform. The WebJet Admin 3.0 utility lets you locate both printers and scanners using criteria such as IP address, model type, color capability, and operational status. It can also automatically update drivers and software via the Internet. A batch function lets an administrator group together several printers and change their settings simultaneously.

The Toolbox desktop icon is a Java applet that lets you see and adjust each monitored printer's status, settings, and current LED readout in real time with automatic updates and alerts. The software can be used on servers running Windows NT, Sun Solaris, HP-UX, and OS/2 Warp.

HP has added several new technologies to improve print quality and performance. We found the LaserJet 4000TN text-output quality to be excellent, with clear, clean fonts and rich blacks. Even under 8x magnification, there were no noticeable jaggies (even in the usual trouble spots like fine diagonal lines and characters set in italic fonts). Continuous-tone bitmaps printed with good detail for 1,200 dpi without blocking in shadow areas. In addition, gradient fills had smooth transitions.

These improvements may be due to a new finer-grade toner material (and less-expensive 10,000-sheet cartridges) that HP has introduced with the new line. Another factor may be more lines per inch for graphics: 180 in ProRes mode and 125 with the FastRes setting. The FastRes mode sends only two bits of data per pixel, compared to four in the true high-resolution setting.

HP LaserJet 4000TN

We tested the HP LaserJet 4000TN in two different modes: the 180 line-per-inch ProRes mode and the 125 line-per-inch FastRes mode. In both modes, the printer performed close to its rated engine speed (17 ppm). We conducted our tests over a NetWare 4.11 network.

[illegible]	ProRes mode	FastRes mode
50-Page Simplex	14.4	15.2

PRINTING SPEEDS

When it came to raw performance, this printer was slightly slower than its rated speed in ProRes on our 50-page time trial, churning out 14.4 ppm. Changing the mode to FastRes perked the printer up to 15.2 ppm. Output using both TCP/IP and IPX protocols (and a mix of PostScript and PCL jobs) posed no problem for the LaserJet 4000TN. It pushed each job out as it hit the appropriate queue.

Hewlett-Packard has added some improvements to cut down the amount of time network users have to wait for pages. An instant-on fuser reduces printer warm-up time. We received the first print in a little more than 15 seconds after sending the job to the idle unit. A 32-bit PCI network interface replaces the LaserJet 5's MIO 16-bit NIC. The new EIO (Enhanced I/O architecture) cards take up half the space, require one-third less power, and offer twice the bandwidth of the older design. HP has used the new space in the LaserJet 4000TN to provide a second NIC slot. HP also offers an optional duplexer ($260 street), a hard disk ($500 street), and a 500-sheet paper tray ($250 street) to complement the two 300-sheet bins.

The new LaserJet 4000TN is a worthy addition to the LaserJet name. It offers a good mix

PRODUCT PHOTOGRAPH BY THOM O'CONNOR

of features, improved output quality, PostScript at no extra charge, and lower cost of operation. Those factors alone make it worth serious consideration for workgroup duty. Add to this the ease of installing and managing the unit over a complex network and the printer may soon become the darling of many administrators.

HP LaserJet 4000TN. Street price: $1,600. Hewlett-Packard Co., Palo Alto, CA; 800-752-0900; www.hp.com. *Choose 406 at www.pcmag.com/infolink.*

XEROX DOCUPRINT N32

Network laser printers are beginning to look more and more like copiers. So it comes as no surprise that the Xerox DocuPrint N32 ($2,900 street) brings some of the company's vast copier expertise to the network printing arena. The DocuPrint N32 has some copier-like features, including an attractive per-page cost.

MAKING MOPIES

The DocuPrint N32 is competing directly with Hewlett-Packard's LaserJet 5Si Mopier (reviewed in "Print! Don't Copy," June 10, 1997), a machine that HP touts as a competitor to the office copier. The heart of the DocuPrint N32 is a 32-ppm Fuji-Xerox print engine rated at 600 dpi. The unit uses a print cartridge ($230 street) that has a 23,000-page life (based on a 5 percent coverage yield). That works out to a penny a page—slightly more than half the HP Mopier's toner cost.

The DocuPrint N32's list of standard equipment is impressive: 12MB of RAM (upgradable to 128MB) and Ethernet and IEEE 1284 parallel interfaces. It can also speak IPX, TCP/IP, DLC/LLC, NetBEUI, and AppleTalk right out of the box. Adobe PostScript Level 2 and HP PCL5 emulation are also provided, and you can select a default-page definition language for each supported communications protocol.

PAPER OPTIONS

The DocuPrint N32's paper handling is equally flexible. The drawer-type printer base holds two 500-sheet supply trays. The trays accept paper up to 11 by 17 inches, and a 50-sheet bypass feeder that is located on the side of the printer accepts paper, envelopes, and up to 32-pound card stock. The DocuPrint N32 comes with a wide range of paper input and output options, including a 10-bin output mailbox ($1,100 street price), a 2,500-sheet feeder ($980 street price), and a 2,000-page finisher/stapler ($1,620 street price). But the most impressive of the options is the duplex module.

PENNY PINCHER: *The Docuprint N32, from Xerox Corp., brings the costs of printing down to a penny a page.*

QUICK STUDY: *The Docuprint does not sacrifice print quality for speed.*

Most duplexers severely slow down a printer's operation. As a result, users may forego two-sided printing (and the accompanying paper savings). The DocuPrint N32's optional duplexer ($460 street price) is rated at 30 images (sides) per minute, making it slightly slower than printing with only one side.

Xerox DocuPrint N32

We tested the Xerox DocuPrint N32 with both single-sided and double-sided jobs. On both tasks, the printer performed exceedingly well, just a bit short of its rated engine speed (32 ppm). We conducted our tests over a Microsoft Windows NT 4.0 network.

▼ Low scores are best ▲ High scores are best	Min sec ▼	Effective ppm ▲
50-Page Simplex	1:45	28.8
50-Page Duplex	1:47	28.5

CENTRAL MANAGEMENT

The DocuPrint N32 includes drivers and printer management software on CD-ROM. PCL and PostScript drivers are provided for Windows 3.1, 95, NT 3.51, NT 4.0, and OS/2. A separate Macintosh partition on the CD-ROM contains PostScript drivers for Mac users. The CD-ROM also includes Xerox's CentreWare DP printer-management software, which allows administrators to monitor and configure all Xerox printers on a LAN from one workstation.

The administrator can check and change interface and protocol settings, check paper and toner levels, and review any printer error messages. We hit a snag installing CentreWare DP, however. The installer program insisted that we needed NetWare Services for NT installed, even though we were installing it on a server that didn't even have IPX installed. We ignored the warning message, started CentreWare, and selected TCP/IP as the management protocol, which worked fine.

POINT AND FIX WITH A BROWSER

We quickly forgot about CentreWare DP once we saw the DocuPrint N32's gorgeous browser-based management interface. Point your browser to the printer's IP address and you're rewarded with a complete, functional, and attractive printer-management interface. Officially titled CentreWare Internet Services, the browser interface lets you check and change every aspect of the printer's operation.

A tabbed dialog box provides access to the printer's main functions, and a tree display on the left margin lets you know just where you are. You can use the browser interface to change printer settings, monitor toner and paper levels, review the printer's error log, perform diagnostics, and print test patterns. The interface also provides an excellent troubleshooting index and quick access to support information on the Xerox Web page.

SPEEDY PRINTS

Like HP's PrintOnce, Xerox's WorkSet technology is designed to minimize the printer's impact on the LAN and improve output performance by storing multiple-copy print jobs locally in the printer. The DocuPrint N32's print speed was outstanding, measuring 28.8 ppm on our 50-page single-sided print test and 28.5 ppm on the double-sided test. The print quality was excellent and consistent.

The DocuPrint N32's paper-handling mechanism is virtually jam-proof (when we intentionally jammed the printer, it was easy to clear). Users can route output to face-up or face-down output bins. The unit automatically offsets each job in the face-down bin by about an inch, so individual jobs are easy to locate.

If you're looking for a fast network printer that's affordable to acquire as well as run, the Xerox DocuPrint N32 is a great pick.

Xerox DocuPrint N32. Street price: $2,900. Xerox Corp., Stamford, CT; 800-349-3769; xerox.networkprinters.com. *Choose 407 at www.pcmag.com/infolink.*

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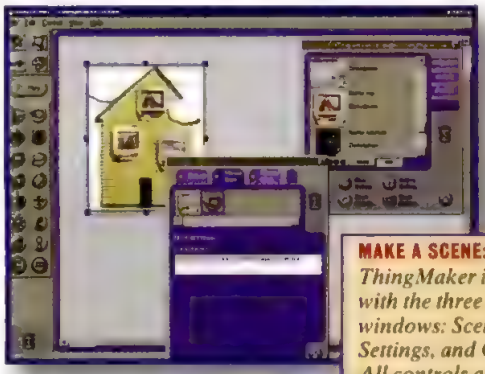
INTERACTIVE MULTIMEDIA CREATION

Doing Your Thing

Thanks to Parable's ThingMaker, some things will never be the same on the Web for nonprogrammers.

By Jan Ozer

Parable's ThingMaker ($99 list) allows nonprogrammers to create a stunning range of Web-based interactive multimedia, from complex, full-screen interactive games to simple animated controls. Media files are small and responsive, with a stable toolset and security in place. Nevertheless, playback is limited to the Microsoft Windows 95 and Windows NT environments, freezing out Macintosh and Unix users.



MAKE A SCENE: *The ThingMaker interface with the three primary windows: Scene, Settings, and Gallery. All controls are drag and drop, and there is no scripting language.*

ThingMaker animates and adds audio and interactivity to bit images in order to create "Things" contained in "scenes" that you integrate into your Web pages. Microsoft Internet Explorer and Netscape Navigator users can play Things by installing an ActiveX plug-in called ThingViewer.

No special Web server software is required; you simply upload the .TMS scene files to your server and point to their location in your HTML code. Things don't stream, however, so they must be fully downloaded before playback begins.

BUILDING THINGS

Three floating windows and a toolbar make up ThingMaker's user interface, reflecting the three-step development process. First you load all assets into the Gallery, which supports most relevant bit-image formats, animated GIFS, and .WAV audio files. Then you drag the assets onto the Scene window—the blank canvas upon which you create your scene. The size of the scene can be as small as a single button or as large as a full-screen animation.

Finally, you define the activities of all Things in the Settings window. Each Thing has three states: default (for when the page is open and there is no Thing-related mouse activity), mouse-over, and mouse click. You select among 14 attributes and actions by dragging an icon from the toolbar to the Settings window for that particular Thing. You can preview all actions in either the program or your browser.

When you've finished building a scene, you can publish the .TMS file containing the scene and an .HTM file containing the appropriate HTML playback code. You can also copy the HTML code to your clipboard for pasting into an HTML editor.

ThingMaker converts all bitmaps into GIFs and compresses all audio before output, so file sizes are very small and quickly downloadable. This makes the format suitable for both simple and complicated effects.

BROAD SUITABILITY

With ThingMaker, it's easy to change a control's colors during a mouse-over or add audio to a mouse click (while also handling e-mail links, hyperlinking, and status messages). Adding motion is as simple as selecting the path tool and dragging the object along the desired path. You can control speed, pace, and the type of motion. Objects can start and end out of the scene, adding to your design flexibility.

Another control lets you layer Things during the animation and hide and replace Things according to mouse location and user interaction. You can detect collisions between Things to trigger even more events or call an external Java script.

PROTECTING YOUR THINGS

ThingMaker can prevent third parties from modifying your Things or even using them altogether. Copyright information and credits can be locked into the .TMS file, preventing others from taking credit for your work. You can also register for a ThingWorld ID, and Parable will even help you track usage and location of your Things around the Internet. Parable also supplies a Thing-Converter Xtra, which converts Director files into Things.

COLLISION COURSE: *ThingMaker has flexible development options for when Things collide. Most actions provide similar flexibility, allowing for many different effects.*

OUR TESTS

We tested ThingMaker by building scenes that were standalone objects and were integrated into tables. We created Web pages in Microsoft's FrontPage 98 and Brooklyn North's HTML Assistant Pro97, pasting HTML code supplied by ThingMaker, uploading the pages to the Web, and testing them on both Internet Explorer and Netscape Navigator.

We found ThingMaker to be remarkably usable for a first-generation program, with one major exception: It lacks an undo command, which is vital for creative programs like these. Minor issues included limited text-creation capabilities and incompatibility with GIFs created in Ulead's PhotoImpact image editor. ThingMaker also tended to mangle the palettes of most other GIFs, but we managed to work around this by using 24-bit images and letting ThingMaker convert them to GIFs.

On the playback front, we found multiple Things played back remarkably well at the same time, but controls occasionally became slightly unresponsive after executing multiple commands on multiple Things in a scene. We also didn't like the way Parable's trademark appeared while images were downloading.

ThingMaker is one of those rare programs that can instantly enhance virtually any Web page. Given its low price and accessible interface, you should strongly consider checking out ThingMaker today—you've got things to do.

ThingMaker. List price: $99. Requires: Pentium PC, Microsoft Windows 95 or NT, 16MB RAM, 5MB hard disk space, Netscape Communicator and Netscape Navigator 3.02 or higher or Microsoft Internet Explorer 3.02 or higher. Parable, Newton, MA; 617-796-0860; www.thingworld.com. *Choose 401 at www.pcmag.com/infolink.*

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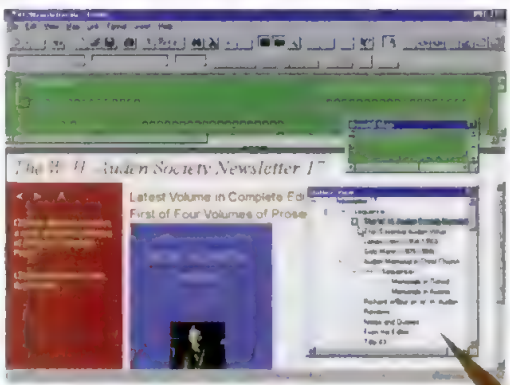
DOCUMENT-EDITING SOFTWARE

A Hyperlinked Hybrid

Trellix easily creates hyperlinked documents, but it may not be powerful enough to replace your existing tools.

By Edward Mendelson

Trellix Corp. hopes you think that word processor documents are too dull to read and Web sites too complicated to create. That's because this vendor wants you to create hyperlinked electronic documents using Trellix 1.0 ($100 street) instead. The program is a unique hybrid of a word processor and a Web site editor that automatically creates hyperlinks among the pages you type.



SEMIAUTOMATIC: *Trellix's navigation tools include a document map that you have to label by hand and an outline view.*

FORGET HTML

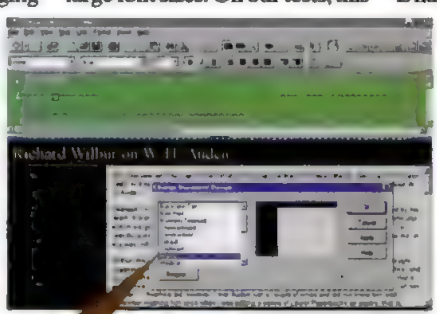
The crucial difference between Trellix and a Web site editor like Microsoft's FrontPage 98 is that Trellix uses a proprietary file format instead of the HyperText Markup Language (HTML) used on the Web. A single Trellix file can contain an unlimited number of linked pages that require separate files in HTML. Trellix can export its files in JavaScript-enhanced HTML, but files saved in Trellix's native format can be viewed with another copy of the program or a freely distributable viewer. As a concept, Trellix is dazzlingly impressive, but most of its features can be found in existing word processors and Web site editors. Users may think twice before switching to a program that uses a new and proprietary format without offering a quantum leap in power or convenience.

Trellix's screen has two main windows: a map window (in which the program automatically builds a diagram of your document) and an editor window (in which you type headings and text and insert graphics). You create a new page by simply right-clicking. A tiny icon for the new page appears on the map, and the editor displays a page template to which you add headlines, text, and graphics.

If your document is based on one of Trellix's sample templates, navigation buttons leading to the next and previous pages are automatically added to the new blank page. You arrange "sequences" of pages by inserting a horizontal line in the map window and dragging page icons to the line. You can rearrange pages or drag them between separate sequences by dragging page icons in the map view. Trellix automatically adjusts the navigation links as you work.

As a text editor, Trellix supports basic word processor features, but it can't create tables. Trellix lacks an Import Symbol feature, so you'll need the Windows CharacterMap applet in order to insert accented characters or foreign currency symbols. Also, you can't create nonbreaking hyphens or spaces. Like advanced word processors, Trellix supports fields (text regions that automatically display and change specified text strings).

You can create hyperlinks by selecting the text you want to use as a link and then clicking on another page in the document map or specifying a remote Web page. The full content of remote Web pages can also be made to appear in Trellix in place of a Trellix page. A document can contain one or more "tours" that guide readers to different sets of pages in the same file; one tour can be an executive summary, another can cover pages with financial details, and so forth. Each page in a tour can have a "narrative" text in the page frame, and the same page can appear with different narratives in different tours.



GRAND SCHEME: *You can change the entire appearance of a document by choosing an overall style from the gallery.*

PUTTING TRELLIX TO WORK

Trellix imports Word for Windows files and automatically breaks them up into separate pages when it finds headers or large font sizes. On our tests, this feature had mixed results: One page in the middle of a large Word file was imported into Trellix with only its headline (not its text), and it did not recognize some special characters.

Trellix's document map breaks a page's link to a higher level when you insert the page into a sequence of pages. It also isn't useful for navigating files. Page icons aren't automatically labeled (except in an awkward zoomed-in view that displays the first few letters of each page title), so you have to type labels on the map by hand. The full title of a page appears on the map only when you move the mouse over the page's icon; you may have to move the mouse over the whole map until you find the page you want. The Find command can bring you to a page, but only if you know the title already. An optional Outline View displays page titles, but it also displays confusing organization symbols.

The idea behind Trellix is that it builds hyperlinked documents more easily than anything else. But in reality, today's word processors and Web editors perform most of Trellix's functions more easily and more effectively. Microsoft Word builds hyperlinks just as easily as Trellix and can create links to an exact location on a page, while Trellix can link only to the top of a page. Trellix automatically creates navigation tools, but so does FrontPage 98 (FrontPage 98 also has a better text editor and image manager). Also, Trellix's badly labeled document-building chart is harder to use than the Web site navigation view in FrontPage 98.

Trellix does produce visually impressive output, and its flexible "guided tour" feature isn't matched by any other product on the market. But unless you need these features, you probably won't find this product unique or powerful enough to tempt you away from the tools you already have.

Trellix 1.0. Street price: $100. Requires Microsoft Windows 95 or Windows NT 4.0, 16MB RAM, 23MB hard disk space. Trellix Corp., Waltham, MA; 888-873-5549, 781-788-9400; www.trellix.com. *Choose 402 at www.pcmag.com/infolink.*

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Brightness	200 cd/m	180 cd/m	150 cd/m
160° XtraView Technology	no	yes	yes

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ELECTRONIC MAIL

Speak to Your E-Mail

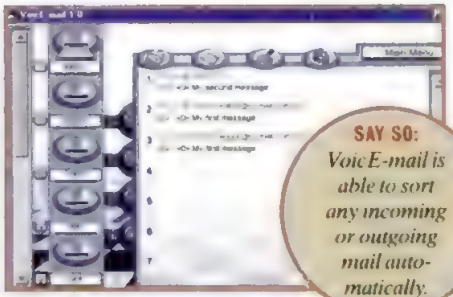
VoicE-mail pairs voice recognition with e-mail in an attempt to ease your inbox overload.

By Alfred Poor

Who hasn't faced a stack of incoming e-mail messages and wished that it were possible to respond just by talking to your computer? If you could dictate your responses, you could clear your in-box in an instant. VoicE-mail, a $49.95 voice-driven e-mail program from Wizzard Software, is an enticing concept. But as is sometimes the case, reality falls a bit short of the mark set by our imaginations.

VoicE-mail is really two separate programs working together. One part is an e-mail program, which has an in-box, an out-box, plus mailboxes called Hold, Trash, and Junk. You can also define your own mailboxes, which will appear in alphabetical order below the five predefined mailboxes. There are some useful extra features, such as an address book, a way to define signature blocks, and a device that automatically sorts incoming and outgoing mail based on the sender's name and the recipient's name, respectively. This last feature is handy, but if you send a single message to multiple addresses, the program recognizes the last address only.

The other portion of the package is a voice-recognition system using IBM's VoiceType. This is a discrete speech engine, which means you must pause slightly between words and commands. The voice portion is capable of both command and control (which lets you navigate within the VoicE-mail program and issue commands) as well as dictation; still, it offers few controls. For example, there is no way to delete or correct a word verbally that you misspoke or that the computer misinterpreted.



SAY SO: *VoicE-mail is able to sort any incoming or outgoing mail automatically.*

The biggest problem is that the two parts don't work all that well together. Only five mailboxes are shown at a time, and you must open them by number. You can scroll the display to see more mailboxes, but the numbered choices will always be one through five. Also, you can start to create a new message or reply by voice command, but you'll have to use the keyboard or mouse to select a recipient's address. There is no way to move or copy a message to a different mailbox by voice.

VoicE-mail makes a good attempt at integrating voice controls with e-mail management, but most users will likely find that they can get along just as well with their current e-mail software without help from voice recognition.

VoicE-mail. Retail price: $49.95. Requires: 90-MHz Pentium, 16MB RAM, 40MB hard disk space, Sound Blaster or compatible sound card, Windows 95 or NT. Wizzard Software; Pittsburgh, PA; 800-721-7701, 412-621-0902; www.wizzardsoftware.com. *Choose 400 at www.pcmag.com/infolink.*

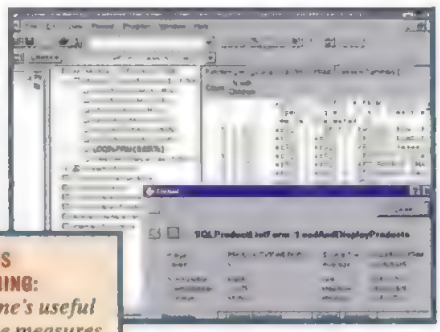
DEVELOPMENT TOOLS

Speed Your Code

NuMega's TrueTime delivers an easy-to-use profiling tool to help streamline Visual Basic programs.

By Richard V. Dragan

To make programs run faster, you have to time them and be able to see what your code is actually doing. Until now, Visual Basic programmers did not have a tool that could do this. NuMega's TrueTime Visual Basic Edition puts an industrial-strength, easy-to-use profiling tool with excellent support for ActiveX into the hands of VB developers.



TIMING IS EVERYTHING: *TrueTime's useful interface measures every facet of your Visual Basic programs.*

TrueTime ($399 list price) is remarkably simple. Just build your VB 5 project with the "Make With TrueTime" option. The resulting .EXE can be instrumented or measured by the TrueTime environment, which gathers an exceptional amount of information about your program.

TrueTime balances expert knowledge, including Windows system API calls, with comprehensible timings of your VB code. A quick tour of your code's performance is given in a session window, which displays which modules were run, how long they took, and similar metrics.

A separate panel lists all of the system DLLs, ActiveX controls, and VB modules called by your program (along with source-code files, where appropriate). There are also lists of the top-20 functions used in your source code and within the Windows API, VB event handlers (such as mouse-click handlers), and ActiveX controls and their interfaces. A details window for all functions is just a right mouse click away.

Besides raw profiling times, TrueTime displays the percentage of time any one function spends in its "child" functions. One of TrueTime's most useful features is that it can let you dig into any ActiveX component or module, including multiple threads and system components. On our tests, this let us profile and improve database code.

TrueTime also provides you with source-code listing along with statistical information of the time spent with each function. This white-box testing feature lets programmers see what code is actually being run and how long it takes. This is potentially the easiest way to use the product, because you can see how source-code changes on individual lines of code affect performance. So if you're a VB 5 developer who wants to create faster programs, TrueTime delivers the information you need to create them.

TrueTime 1.0 Visual Basic Edition. List price: $399. Requires: 486-based PC or better, Visual Basic 5, Windows 95 or NT, 8MB RAM, 6MB hard disk space, CD-ROM drive, SVGA graphics. NuMega Technologies Inc., Nashua, NH; 800-468-6342, fax: 603-578-8401; www.numega.com. *Choose 403 at www.pcmag.com/infolink.*

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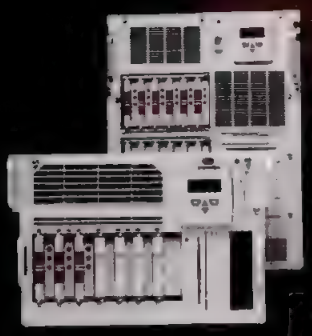

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PERIPHERALS

Special Delivery

With or without your PC, ASP Computer's EZMail will forward, fax, and screen your incoming e-mail.

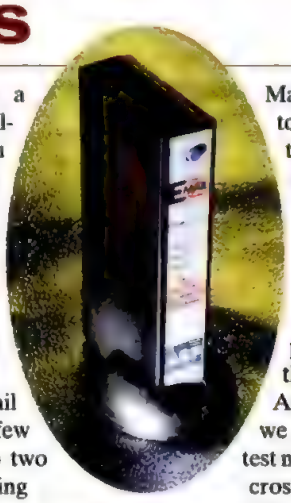
By Les Freed

If you're chained to your desk for fear that you'll miss an important e-mail message, ASP Computer Products' EZMail ($299 list) can cut you some slack. ASP calls EZMail the "Internet Answering Machine," and that's exactly what it is. EZMail dials into your ISP, collects your e-mail, and either temporarily stores it in its memory or relays it to a fax machine or printer. EZMail can even dial your pager when new messages have arrived.

EZMail has its own CPU, RAM, and modem that can connect to a phone line and your PC's parallel port. Four LEDs indicate the unit's operating status, and pushing a single button sends stored messages to the attached printer. Once you have connected EZMail to your PC and phone line, you run a simple configuration and scheduler program to tell EZMail where and when to dial and how to log into your ISP. EZMail operates independently of the attached PC and printer, so your PC doesn't have to be on—or even present.

EZMail can collect mail from up to four e-mail accounts on four separate ISPs. You can select a separate destination for each account, and you can tell EZMail whether or not to delete messages as it retrieves them. EZmail comes with multiple login scripts that cover most ISP login procedures, including SLIP and PPP logins. And you can create your own custom login script if the canned ones don't work with your ISP.

Not every incoming e-mail warrants pager notification, so EZMail contains a simple two-stage filter that allows you to filter incoming e-mail before the unit pages you. You can also screen incoming messages by any standard e-mail header field.



IT'S EZ: *Pushing a button will print EZMail's stored e-mail messages.*

We left EZMail running for a few days, dialing into two ISPs and relaying mail to a fax machine, and the product performed perfectly. If you're out of the office and need to change EZMail's output destination, you can send yourself an e-mail message containing special EZMail commands.

We did uncover a few faults with this product, however. First, its pass-through printer port isn't bidirectional. This meant we weren't able to print to the HP DeskJet 1000C attached to our test system (that printer requires a bidirectional connection). EZMail also can't print to older printers that use a Windows-based print engine (like the DeskJet 820 and 1000).

Second, EZMail cannot display messages that are not plain ASCII text. When we sent an HTML test message from Microsoft Outlook to EZMail, it reported that it had received a message with a MIME attachment, but it couldn't display the attachment on the remote fax machine.

Minor quibbles aside, however, ASP's EZMail is a good solution that impressed us with its simplicity and reliability.

EZMail. List price: $299. ASP Computer Products, a division of CTG Inc., San Jose, CA; 800-445-6190, 408-746-2965; www.asp.net. *Choose 404 at www.pcmag.com/infolink.*

PERIPHERALS

Lose Wait Fast

Promise Technology's Ultra33 Controller speeds Ultra ATA/DMA hard disk performance.

By Alfred Poor

Users yearning for faster system performance will welcome the new Ultra ATA/DMA hard disks, which can transfer data at rates up to 33 MBps. Unfortunately, older systems don't have the EIDE controllers that can take full advantage of the added performance of these new drives. Promise Technology has a long-standing reputation for solving hard disk problems, and its Ultra33 controller ($80 street) provides an easy way to add support for the latest drives.

This PCI card can automatically distinguish between Ultra DMA and EIDE drives, and it can also configure itself for optimal performance with both. The card has two channels, both of which can accept two devices. One special feature of the card is that it has two timing controls per channel, so you can mix EIDE and Ultra DMA drives on the same channel without affecting performance.

ULTRA-FAST: *The Ultra33 can n… most of your new…*

Another attractive feature is that the Ultra33 will coexist with your system's existing IDE controller; you can leave your EIDE controller functioning and use it to drive slower devices (such as CD-ROM and tape drives) while using the Ultra33 for your boot disk and your other hard disks.

On our tests, we showed that the Ultra33 can make a noticeable difference in performance, but the gains were not as dramatic as might be expected. For example, an IBM Ultra DMA hard disk on the integrated IDE controller in a Pentium/166 PC produced scores of 1,090 and 2,660 thousand bytes per second on the ZD Business Disk WinMark 98 and High-End Disk WinMark 98 tests, respectively. When attached to the Ultra33 controller, the same drive managed test scores of 1,140 and 2,750 thousand bytes per second, which amount to about a five and three percent boost, respectively. On a test of straight sequential reads, the gains were more significant, rising from 7,646 thousand bytes per second with the integrated IDE controller to 10,330 thousand bytes per second with the Ultra33 card (this is about a 35 percent gain).

Promise Technology backs the product with a two-year warranty and provides drivers for Microsoft Windows 95, DOS 5.*x* or later, Microsoft Windows 3.*x*, and Microsoft Windows NT 3.*x* and 4.*x* (OS/2 drivers are not yet available). So if you want to get the most out of a new Ultra DMA hard disk, the Ultra33 is the ideal complement.

Ultra33. Street price: $80. Promise Technology, San Jose, CA; 800-888-0245, 408-452-0948; www.promise.com. *Choose 405 at www.pcmag.com/infolink.*

PHOTOGRAPHY BY THOM O'CONNOR

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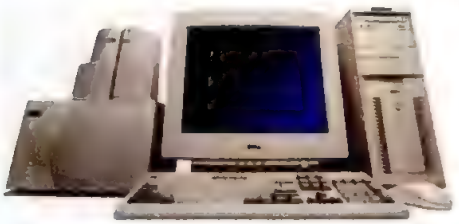

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Second Looks

AVATAR SHARK 250

Read the Instructions

By Bruce Brown

When we reviewed the parallel-port version of Avatar Peripherals' Shark 250, a mobile disk drive ("Online Services: Is It Time to Jump?", May 6, 1997), we praised the rugged disks and admired the drive's speed and capacity for use on the road. A PC Card version of the portable drive is now available, and except for the way it attaches to a PC, it shares most of the same admirable traits of the parallel-port model. And it's faster.

The PC-Card Shark 250 has a rated average transfer time of 2 MBps (megabytes per second), up from the parallel-port version's 1.25 MBps. With that transfer rate, the Avatar drive is fast enough for storing and running applications, not just data storage and backup.

We liked the Shark 250's sleek design and packability. Together the drive, the card with attached 14-inch cable, and a single HARDiskette weigh 1 pound. Like the parallel-port version, the PC Card model doesn't require an external power supply, as it is able to get sufficient power via the PC Card slot. Although some notebook PC Card slots may not provide enough power for the Avatar drive, the Gateway Solo 9100 and Micron Millennia TransPort notebooks we used were both able to run the Shark 250.

Living with the Shark 250 for a few months proved that the disks and the drives themselves aren't invulnerable, though all should be well if you follow the instructions printed in the manual. We didn't see the one warning not to travel with the HARDiskette in the drive, which resulted in ruining the disk and harming the drive head.

The drive automatically ejects the disk when Windows 95 is shut down, but when we used suspend mode for traveling with the notebook, the disk and drive were both damaged.

Although we'd prefer to be able to travel with the disk in the drive for convenience, the translucent rubbery plastic case that each HARDiskette comes in adds little weight or bulk to your carrying case.

NETSCAPE COMPOSER

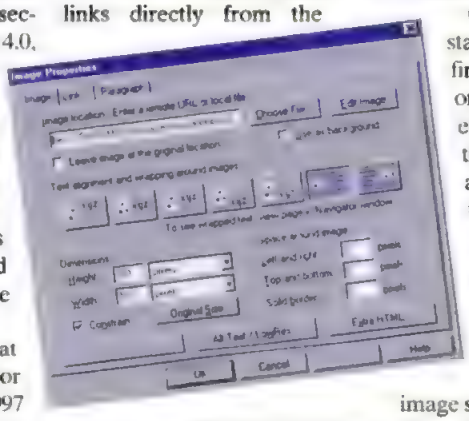
Feature-Rich Web Editor

By Edward Mendelson

Netscape Composer is a straightforward and easy-to-use Web page creator that's best suited for creating and uploading single pages. Its second release, dubbed Version 4.0, is part of Communicator 4.0 (Standard Edition, $59; Professional Edition, $79). The new version improves on the original by adding features usually found only in higher-priced programs (such as spell-checkers) and the ability to add or delete columns in tables.

When we last looked at Composer in our HTML editor roundup of March 4, 1997 ("Grand Designs"), the program was part of Netscape Navigator 3.0 Gold. The new version makes available additional features via plug-ins that can be obtained from the Netscape site. Composer still doesn't support advanced HTML features like frames or forms, but plug-ins are now available for each.

Composer's uncluttered WYSIWYG interface closely resembles that of the Navigator browser. You can drag graphics and links directly from the



browser or Windows Explorer into the editing window. If you drag a graphic onto a Composer page, the program automatically saves the image into the same folder as the page, ensuring that the image will appear on the page when uploaded to your Web server. Composer also helps obviate broken links by reminding you to upload any pages linked to the one you are creating. And tight integration with Netscape Messenger e-mail lets you use the program to compose elaborate e-mail messages—complete with headlines, bold and italic type, and graphics—and send them with one command.

Composer does an outstanding job helping you define how images will appear on your page. Thumbnails effectively clarify the options for aligning images and wrapping text around them. You can easily add lines, tables, and headings from the menu or toolbar, and right-click pop-up menus give you quick access to such advanced properties as image size, alternative text, and other HTML features. You can insert custom or unsupported HTML code using a button that appears in most dialog boxes.

Additional features can be added to Composer 2.0 using plug-in modules available from Netscape's SmartUpdate page (*home.netscape.com*). The most useful module lets you edit your page's raw HTML source code. This helps you make changes and adjustments that are faster and more efficient to make directly to HTML code or that cannot be accomplished with WYSIWYG editing. When you close the module, your changes appear in the WYSIWYG editing window. Another module lets you remove tags from selected text, making it easy to change italicized text back to roman in one step. This tool also lets you remove a hyperlink without removing the linked text.

Unlike Navigator, Composer doesn't support frames, so you can't use it to modify an HTML frameset page. But you can use it to edit and preview the no-frames section of a frameset (that is, the section that appears in browsers that don't support frames). This makes Composer useful for advanced HTML coders who use editors that can't preview the no-frames section, such as Allaire's HomeSite.

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Perfect Talk, Perfect Silence

How will we know when we've achieved perfection in communications? When we don't actually have to talk to anybody any more. We're pretty far down that road already and getting more antisocial every day. What is it about people that makes them dislike contact with others so much?

Why drop by someone's office when you can phone? Why talk to someone on the phone when you can leave voice mail? Why leave voice mail when you can send e-mail? This syndrome is not limited to business. I regularly traverse the curving, black length of the Garden State Parkway, on which you have to pay 35-cent tolls at irregular intervals. The cars clog up in the exact-change lanes, while I breeze through one of the attended lanes. Do the other drivers really think they're getting through faster in the automated lanes? No, they're just avoiding human contact with a toll collector.

I've noted before in this column the phone call in which the caller says, "Oh, Bill! I didn't really want to talk to you. I just wanted to leave a message on your voice mail to tell you that the meeting time's been changed." Likewise, I've noticed an uptick in the number of messages left after 6:00 P.M. and on weekends. Same deal: Talking to you slows them down.

In a similar vein, look at the tremendous business done in catalog shopping and direct marketing. Once upon a time, the Sears catalog was a way to bring a huge store, full of goods, to the frontier, to the prairie, to the backwoods. Then it became a wish book for suburbanites, loath to fire up the family car and drive downtown in the era before shopping malls. Then paper got too expensive and an era ended. Today, the economics of direct marketing dictate that catalog retailers be highly targeted specialists, not generalists. But the Internet has changed all that, and the big catalogs are coming back—to a world where there's no paper and no postage.

Now that you're shopping online, you have to choose between an operator manning an 800 number and an online purchasing system. Which one will you go for? The one that has the least human contact, of course. Electronic commerce isn't being driven by convenience but by fear of social intercourse.

Newton owners have been able to exchange business cards electronically for years by means of their machines' infrared ports. Why mess with those tacky little pieces of cardboard and the small social rituals surrounding them?

A researcher at IBM has taken what Newton started to an illogical extreme. He's the latest to propose a wearable computer, with the additional fillip of using your skin as the local area network. He currently gets 2,400 bps from the wrist-display unit to the computational unit in your shoe. (Future designs may run on the electricity generated by electrolysis from your sweaty feet or from jolts generated by piezoelectric crystals as you walk around.) He foresees your skin eventually being host to communications at 4 Mbps. With this wearable network, you'll be able to exchange business cards by shaking hands. This concept raises the issues of hygienic computing to previously undreamed-of levels. You and your computer could catch multiple viruses—together.

ASOCIAL BEHAVIOR

Guys who have trouble saying "I love you" to their wives are revealing their hearts in chat rooms.

On the flip side, the computer has enabled us to form deep emotional attachments to people we will in all likelihood never meet. The gentle art of correspondence has been usurped by instant messaging and chat services that notify dozens—perhaps hundreds—of people when you're online and ready to start blasting messages back and forth. The fundamental concepts of friendship and family are having a collective psychotic episode as virtual clans and families form, dissolve, and reform in chat rooms and game server lobbies. Guys who have trouble saying "I love you" to their wives are passing their hearts and brains around the chat room for the group's inspection. All of this social give-and-take online isn't a dress rehearsal for the real thing; it's a surrogate. Concern for one's virtual family members supplants concern for the real flesh and blood around us.

I welcome new technologies, but I want technology to build bridges, not walls. Are we too short on time to be nice to one another? Maybe the connections afforded by a wearable computer will help some day.

I'm not so sure about the handshaking part, though. Maybe if the computers beep to let us know when it's okay to let go. PC

PHOTOGRAPHS BY BOB HOLMGREN

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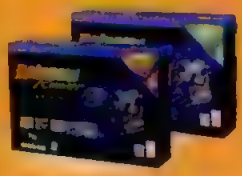

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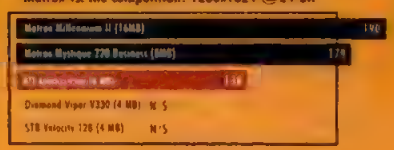

matrox

JOHN C. DVORAK

The Fight to Be the New Floppy Disk

As Comdex gets bigger and bigger, it's much more difficult to cover. This year's event was a mess, with traffic snarls and missed appointments like no event before. With over 200,000 attendees, Comdex has changed its nature and is completely international in scope. It's also become like the elephant and the six blind men: Nobody sees the same thing.

The most obvious themes at the show were the sub-$1,000 computer and the sudden emergence of 3-D graphics. Everyone was talking about 3-D, even though the only applications for true 3-D technology are games. Whatever the case, "3-D" appears to be the primary candidate for the most overused and abused term in 1998.

What seems to be overlooked by most observers is the impending battle of ancillary disk drive devices. By this, I mean the Zip drive versus the LS-120 drive versus the HiFD drive.

The situation unfolding is reminiscent of the old battle between various replacements for the 5.25-inch disk drive, which was finally won by the 3.5-inch disk drive—but not without a struggle. A number of interesting formats were contenders, including a hard-case, 3-inch disk from Amdek and a soft-side, 3-inch disk from Tabor-Dysan, which, as numerous software vendors were buying into the format, was close to taking over the market.

In the early 1980s, Hewlett-Packard was the first to use the 3.5-inch disk on its computers. Its lead was followed by the Apple Mac and finally the IBM PS/2—a five- or six-year process. In between, the 1.2MB 5.25-inch disk—always much faster than the 3.5—came along and could have easily fended off the 3.5-inch model, which has improved little in the past 15 years. It seems the 3.5-inch disk's potential alone killed the 5.25-inch disk drive.

Over time, the so-called Floptical scheme was developed, which let 3.5-inch media be coded with a servo track that carefully controlled the drive head. At first, various 20MB drives were introduced, but nobody bought them. Then Toshiba introduced its ED disk, a simpler upgrade to the 3.5-inch that allowed for 2.88MB. This disk was used by many companies, including IBM in the early ThinkPads. It never caught on, and soon the format seemed jinxed.

Once the Iomega Zip Drive captured the public's attention, it was obvious that people needed something to replace the 1.44MB drive. Soon, the Imation LS-120 drive cropped up, to be used by Compaq. It had 120MB of storage and backward compatibility with old 1.44MB drives. A year or two later, only Compaq, Maxell, Mitsubishi, and NEC seemed interested. And NEC is using a Zip Drive on its new computers.

ZIP/LS-120/HIFD

Overlooked by most observers is the impending battle of ancillary disk drive devices.

So along comes Sony—inventor of the 3.5-inch drive—with an upgrade: the HiFD disk drive. Also a 3.5-inch drive, the HiFD is 240MB unformatted, 200MB formatted—about twice the capacity of the Zip and LS-120 drives. With full backward compatibility, the HiFD appears to be the immediate "I want *that*!" drive people will flock to. It steps right over the current Zip and LS-120 drive market for about the same price, and it also destroys the 230MB optical drive market, forcing those folks to move to the 600MB-plus arena, where they should have moved years ago. The 230MB SyQuest EZ Flyer and other small-capacity, removable systems will be dead meat. The HiFD drive also works at hard disk speed, finally taking the 3.5-inch drive off the bottleneck list.

But since the LS-120 can probably upgrade to 240MB, and since Iomega is not about to give up trying to make its technology a standard, I suspect we'll have to go through another five- or six-year incubation period before the winner emerges. I'd bet on Sony in the short term, both for its excellent technology and for its good relationships with other vendors. I'd hate, however, to count Iomega—with its top-notch marketing and sales organization—completely out. A key to this may be the kick-butt manufacturing capabilities of Alps, TEAC, and other licensees, which can flood the market overnight with these devices. The media makers are also players in this drama. Maxell is a partner with the LS-120 camp but would defect in a minute. Fuji is signed on with Sony. By the time you read this, the media makers will probably have taken sides, but it may be years before this shakes out.

The question on my mind regarding this is: Why has it taken so long for the computer user to begin thinking about a new floppy disk medium? The Zip Drive was the wake-up call, and now things are starting to happen.

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JOHN C. DVORAK

Inside Track

The **plot thickens** in the world of microprocessors: Digital and Intel have closed their various lawsuits against each other, with Intel somehow **getting the Alpha chip** in the process. Or I should say, "getting the Alpha chip process." Now I'm wondering if Digital meant for this to happen all along. The Alpha chip did not look as if it would ever turn the corner. Apparently being the **fastest chip** in the world did it little good without proper marketing. The Digital 8400 remains the best server on the market, and it uses the Alpha chip. Both Intel and Digital claim that nothing will really change except that the Alpha will be manufactured by Intel.

The Alpha chip did not look as if it would ever turn the corner. Apparently being the fastest chip in the world did little good when it wasn't marketed properly.

Much of this rethinking product lines has to do with the IA-64 architecture announced by Intel. This is the 64-megabit (64Mb) chip that **will take over the world,** Intel says, around 1999. Everyone who looks at this thing sees no hope for anything else on the market. It's that good. Of course, everything looks good on paper. Intel is **notorious** for having start-up problems when doing something as major as this. And we're also back to the nonsense that this chip will be used only in servers and high-end workstations, which means it'll be in your desktop machine within weeks of shipping.

In other related Intel news, look for the development of a hot-swappable PCI bus this year. Since high-performance online servers lose money for people if they go down for even an instant, a hot-swappable PCI bus is needed for on-the-fly upgrades and repairs. Personally, I liked the good old days when you'd **hot-swap cards** on a live machine just to see what happened.

The big buzz at Comdex was the sub-$1,000 computers. They've grabbed a 40 percent market share overnight. This has Intel more than **a little freaked,** as the IA-64 and other high-performance systems look for a reason to exist. Last week, I took home the new sub-$1,000 Compaq Presario and **installed and booted it in 11 minutes flat.** I was impressed by both its styling and its performance. I think this machine would be **perfect** for almost any new computer user. The expensive high-end systems will be getting 3-D and other fancy features for applications to take advantage of the new technologies, but do we need them? I have a carload of things I have been unable to unpack. There are dozens of photo-editing packages I want to try, for example. **I'm expecting a slowdown,** if not a downturn, while users regroup and rethink their computer strategies.

Will Vegas Throw Out Comdex? Dept.: Maybe, maybe not. Some of the garment-show promoters were so concerned about being thrown out of town that they distributed a guide to courtesy and tipping and insisted that everyone on their staff follow the rules. Comdex should do the same. The town **complains bitterly** about the **cheapskate nature** of Comdex attendees, many of whom are filthy rich. Now that Vegas is the leading trade-show town in the world, it's getting choosy.

Genuinely Interesting Hardware Dept.: At Comdex, Q-Sound was showing the Ultra-Q, a cool $59.95 gizmo that adds a 3-D sound spatiality that must be heard to be believed. A pioneer in creating incredible **audio illusions,** Q-Sound was the first company certified by Dolby to create five channels of discrete sound from two speakers. This little box adds that kind of dimensionality to the two small speakers hooked to your computer system. With the flick of a switch, your sound is blown out about 20 feet to the right and left of the listener. Amazing device. Contact Q-Sound in Calgary (403-291-2492) to get one. For those of you doing **streaming audio** over the Internet, find out about the company's Q-Sound IQ, which adds 3-D sound.

Jamming It Together Dept.: At least one company was showing a card that uses one of the vaunted **media processor chips**—in this case, the Mpact chip from Chromatics Research. The company is Proside Corp. out of Japan (phone 81-43-279-9280). The various cards from this source are all rather **stunning.** Using only one IRQ, the PRS-MP36000 adapter card incorporates the Mpact chip and Rambus to act as a full DVD decoder (including all the needed encryption stuff), digital audio, modem, fax, videophone, 3-D graphics adapter, and video capture card all rolled into one. Another version has Dolby AC-3. The company also produces a motherboard **loaded with features.** These functions can all work simultaneously, according to the literature. An impressive concept, for sure. Such media processors add a new dimension to our computers.

The **disk drive scene** needs to be watched more closely as SyQuest turns up the heat on Iomega. The latest salvo is the remarkable $599 Quest drive, a 5.25-inch removable hard disk with a 4.7GB capacity. Yikes! The blank disks will be $199 each, making it one of the **cheapest deals** out there. SyQuest has an incredible line of drives but can't seem to get backward compatibility with older products. It's getting rather confusing. But the drives are fantastic.

Though SyQuest is going to large capacities, Iomega is going small with the introduction of its new Click drive—a dinky 40MB drive. At its booth, it was handing out huge chocolate bars and little "clickers"—those things you push with your thumb to make a froggy, clicking sound. I guess everyone was **jazzed on the chocolate,** because all around the booth you heard this incessant manic clicking. **Great publicity stunt.** PC

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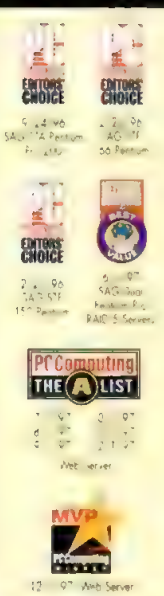

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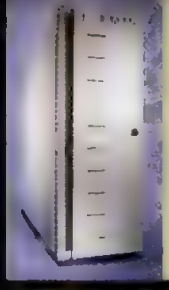

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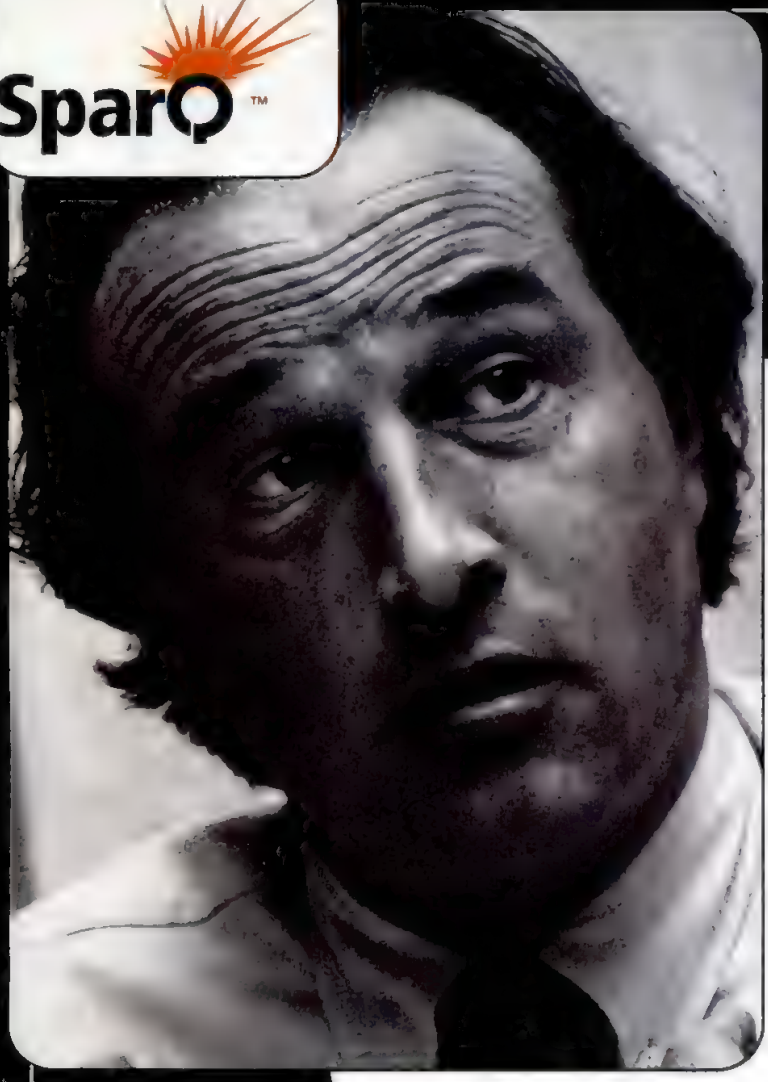

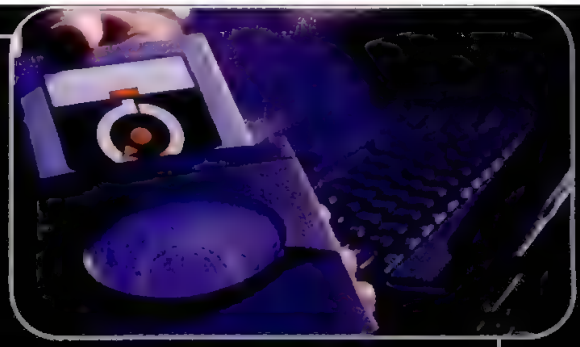

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JIM SEYMOUR

The Hidden Side(s) of Y2K

As many of you know, I wear a second hat, beyond that of *PC Magazine* columnist. I run a consulting practice that works with large and medium-size companies in North America, Europe, and Asia on information strategy issues. As a columnist, that connection is invaluable, because it takes me inside the problems many of you deal with at work, whether you're in your firm's IS shop or simply a user of computer technology. Becoming disconnected from the real, immediate needs of real people is always a risk for pundits and writers; the day-to-day immersion in problem solving in the Real World keeps me in touch with reality.

Though we work with corporate clients mainly on mid- to long-term strategic issues, the issues we grapple with have a direct impact on the computing resources available on millions of corporate desktops. Even when the time lines on these projects stretch into what clients like call mid- to long-term—which in this business often means next week or next quarter!—the complexity and urgency of the tasks means that we're working *today* to deliver the answers you're going to be demanding in too few months or years.

No part of our consulting practice has been more complex or more frustrating over the past few years than what is generally known as the "Y2K Problem." You know the basics: Shortcuts in programming over the past 40 years mean that much of the software underpinnings of Corporate America—and what I increasingly think of as the Corporate World—is built atop systems that, come January 1, 2000, will not be able to handle dates properly. By typically allocating only two digits for storing year information—89 for 1989—programmers dug a very deep hole indeed for us all. These systems will either read the year 2000's 00-year entries as 1900 or simply stop, unable to proceed. Come the dawning of Y2K, many vital systems won't be able to function when calculating dates. And date calculations are fundamental to virtually every business computing process.

A lot of us will get funny letters identifying us as -37 years old. Funny at least for a little while—until insurance policies are canceled, deposits go astray, checks bounce, embedded systems in equipment of all kinds fail, part of our commerce grinds to a halt, businesses collapse, and jobs disappear. Then it won't be funny at all.

TROUBLE BREWS

Y2K will be the single biggest business crisis many of us will face in our lifetimes.

While others have gotten great press running around to the popular media screaming, *"The sky is falling—or will fall soon!"*, The Seymour Group has been working with corporate clients to identify problem areas in their systems and fix the problems. Well *before* the sky falls—we hope.

I would like to tell you that our hard work—and the efforts of hundreds of Y2K-focused consulting firms around the world—has pretty much worked, and that long before we hit the Y2K wall less than two years from now, the problems will be pretty much solved.

I would *like* to tell you that—but it would be a lie.

Y2K issues form an increasingly large part of my work, but only a part. I'm not a Y2K specialist, but I find that many, many firms, including some surprisingly large ones, have continued to drag their feet on fixing Y2K-related computing infrastructure problems and now won't possibly be ready to avoid disastrous problems come that cold January morning.

For one thing, virtually everyone competent in the Y2K analysis-and-fixes business is already fully booked through January 1, 2000, and beyond. Companies with Y2K problems now often cannot find people to work on those problems. Not just enough people, but *any* people.

Some of these firms hold your money—in bank accounts, life insurance policies, annuities, and so forth. Or your continuing income—in salary and accounting routines, personnel files, and retirement benefits. Or they control processes essential to your daily routine and well-being, from the operation of emergency rooms and blood banks, drawbridges, and toll gates to the scheduling of airline flights and passport issuance. You will not be happy when they can't service your withdrawals, properly credit your payments, let you on the tollway, and get you to Toledo or Rome.

The estimates of the costs of fixing our Y2K problems before January 1, 2000, range up to $200 billion and more. The costs of *not* fixing these problems? Incalculable, terrifying, catastrophic. Do we really need to spend $200 billion to avoid the cataclysm? I haven't a clue: No one knows how much it

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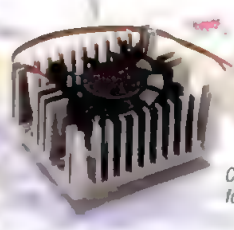

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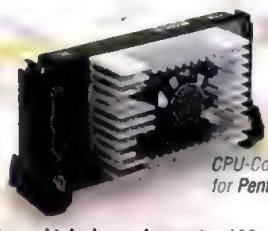

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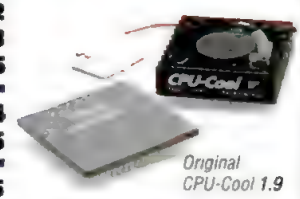

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JIM SEYMOUR

would cost to avoid Y2K disasters—or how much it will cost if we *don't*.

The Y2K business—and it is extremely profitable—is full of misinformation, hype, fear mongering, and exaggeration. Certainly some of that is crass, self-promoting hype by such entities as consulting and programming shops, which stand to benefit from spreading fear about Y2K meltdowns. But a tragic if understandable backlash has begun against Y2K warnings that is ultimately even more destructive: the claim that Y2K is a myth, a nonissue that will go away if the loudmouths will just shut up.

It will not. It is real. I believe Y2K will be the single biggest business crisis many of us will face in our lifetimes.

Here's a very small example of the difficulty and pervasiveness of solving Y2K issues for business—one I've been talking about to business and trade groups for four years now. Let's say you ferret out your company's internal Y2K issues, dig through all that spaghetti code, bring back in your retired COBOL programmers, hire hot-shot consultants to audit the results, and proliferate the solutions throughout the company.

What about your suppliers' Y2K compliance? In an era of ubiquitous electronic data interchange, what if only 20 percent of your suppliers—in my experience, a wildly optimistic number—haven't fixed their Y2K issues by January 1, 2000? Can you build cars with everything in place except, say, a carburetor and a gas tank? Can you operate *any* business with a few weak-links-in-the-chain rogue suppliers in your network? Hmm?

If you're working hard on your own company's Y2K problems now and feel you're well along, have you devoted similar attention to all of your suppliers' efforts to fix their Y2K issues? Have you even started making up a list of those key suppliers?

I've avoided writing a Y2K Fears column until now because I find it unseemly to be associated with the sky-is-falling types. I've been confident that American business, indeed global business, would address this problem early, aggressively, effectively.

I was wrong. They didn't. *We* didn't.

Where is *your* company in assessing and fixing Y2K issues? What about your PC BIOSes, network software, legacy code, and systems? Is it time for you to start rattling some cages?

Will your company be open for business in January 2000? Six months later? PC

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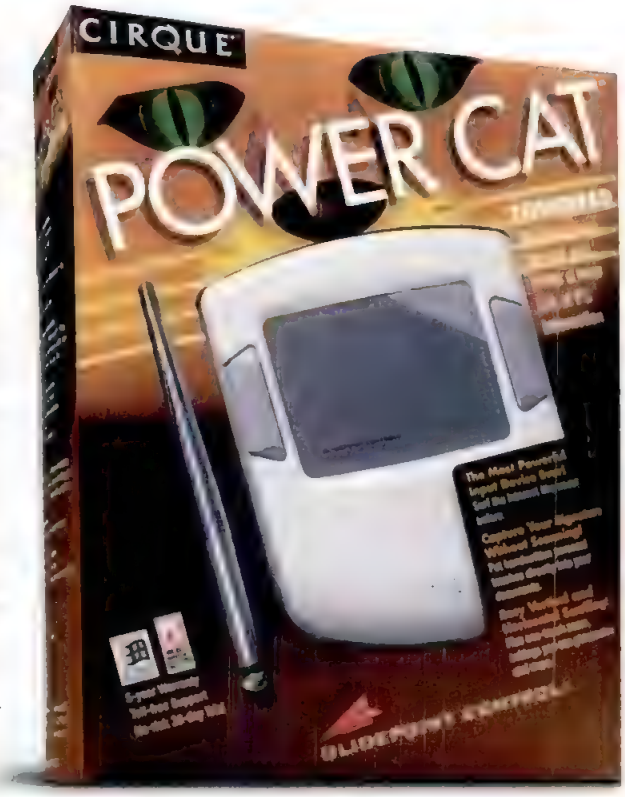
"Window Stellar" NOVEMBER 1997



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Florida Union Times

"These 'cats' could chase off your mouse...navigate Web pages without having to move the on-screen cursor."
Business Week

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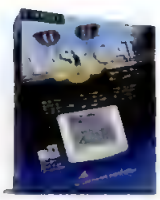
Windows Magazine



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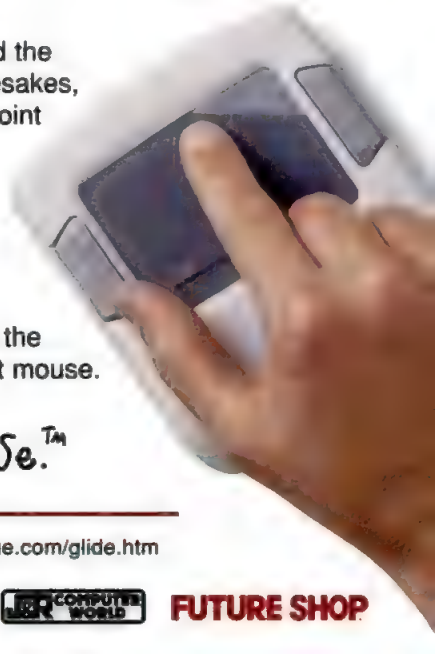
These Cats have people scratching at the doors of stores all over the country. Get one and see how they can outperform even the smartest mouse.



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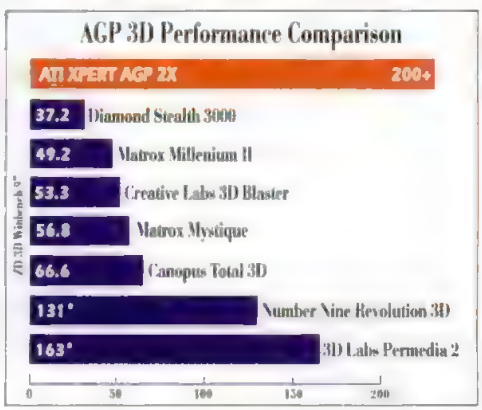

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3D Performance Comparison graph. Tested on Pentium II MMX 266MHz, 32MB 512 cache/ Windows 95 OSR2 Test Mode: 1440x480x16 bpp@75Hz. Tested using Driver Version: ATI XPERT AGP 2X 4.[illegible] 88Hz Diamond Stealth 3 3[illegible] 4.03.00 3205 Matrox Millenium II 4.[illegible] 3D Blaster 4.[illegible] Matrox Mystique 4.[illegible] 141 Canopus 4.03.[illegible] 9001
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BILL HOWARD

The Lightweight Portable Frontier

Choices, choices: notebook PCs that weigh as little as 3 pounds, Windows CE 2.0 hand-helds from half a pound to 2 pounds, cellular phones with Web browsers, and old favorites such as the Palm Pilot. Here's my take on what's going on in the portable arena.

If you're using your portable computer to *create data*, meaning you're typing a lot, then you need a real Windows or Windows NT computer with full-size keys, a 10-inch or better display, and hard disk storage.

If you're using your portable computer mainly to *access data*, then you might be a candidate for a hand-held, palmtop, Windows CE machine, pocket computer, or PDA. The taxonomy is still up in the air. "Minicomputer" would be a great term if Digital hadn't usurped it back in the 1960s. I think the lighter devices will wind up being called *PDAs* or *hand-helds*.

COMPACT POWER
Stick with notebooks, but consider adding a half-pound hand-held companion.

The dividing line is about 3 pounds. Anything less can't have rotating mass storage (a hard disk) or anything close to a full-size keyboard. Note that Mitsubishi, Sony, and others are working on real notebook PCs that weigh in at exactly 3 pounds. The magnesium-case Sony PCG-505C, announced in Japan and likely to make its way stateside, is a marvel. Sony did make a few curious design compromises, most notably specifying an 8-mm-tall hard disk when a 9-mm drive would have doubled the 1GB disk capacity. But the 10.4-inch SVGA display is wondrous, and the word *magnesium* is magic to anyone who's been around sports cars (*mag wheels*).

The Windows CE machines come in three flavors. *Gryphon* is the code name for the half-pound devices. These are the ones Microsoft fervently hopes will rein in the 3Com Palm Pilot, which has already sold more than 1 million units. (Imagine, the cheek of Palm-USR-3Com in thinking that OS standards might be set outside Redmond!) These are units that can work in conjunction with notebook or desktop PCs, and they're read-mostly devices. I think the half-pound category of hand-held devices is going to be hugely successful. They're so cheap (at well under $500) that even if your company won't buy you one, you could still afford to get one yourself.

The Win CE devices weighing about 1 pound are code-named *Mercury*. These tweeners have rudimentary keyboards, but there's no way you're going to be doing much typing on them. Their success is less certain because so much about them shouts compromise: too big to fit in your pocket, too small for easy viewing or keyboard entry.

Think of the high end of Win CE devices—currently called *Jupiter*—as 2-pound "Honey, I shrunk the subnotebook" devices. The keyboards will be sort of typeable, the displays sort of legible, and the sub-$1,000 price sort of reasonable. Software will be in ROM and storage in 20MB to 50MB memory cards. You'll want to use one of these if you get a lot of e-mail but don't compose long responses. If you're using a notebook now, either dump the notebook or dump Jupiter; you don't need both.

After seeing half a dozen Windows CE prototypes, I'm convinced color is going to be essential to Win CE devices. Color makes screens seem bigger and crisper than the same-size monochrome screens. Battery life will suffer with color, but it's not so hot with anything other than the nonilluminated mono displays. Right now no sub-3-pound device is close to giving you all-day computing.

Win CE 2.0 looks adequate, and you might get some utility. I thought 2.0 would be where the hardware and software vendors got it right. Now, I think Version 3.0 is where the bulk of the rough edges will get sanded off.

Among non–Windows CE devices, I'm intrigued by *smart phones*, or *cyberphones*. This kind of two-way device combines a standard analog (AMPS) phone in the North American market with the ability to receive and send limited messages across the Internet. The big problem is that the units out now are clunky, weigh close to a pound, and want a belt holster rather than a shirt pocket. These would be a lot more useful if we jettisoned the analog phone system, but that's not in the cards soon.

What should you do? Most notebook users should stick with notebooks and also consider adding a half-pound hand-held companion, most likely the Palm Pilot but also one of the Win CE Gryphon devices. Desktop users who travel occasionally should give consideration to the 2-pound Jupiter devices and to the best of the 3-pound true Windows devices. PC

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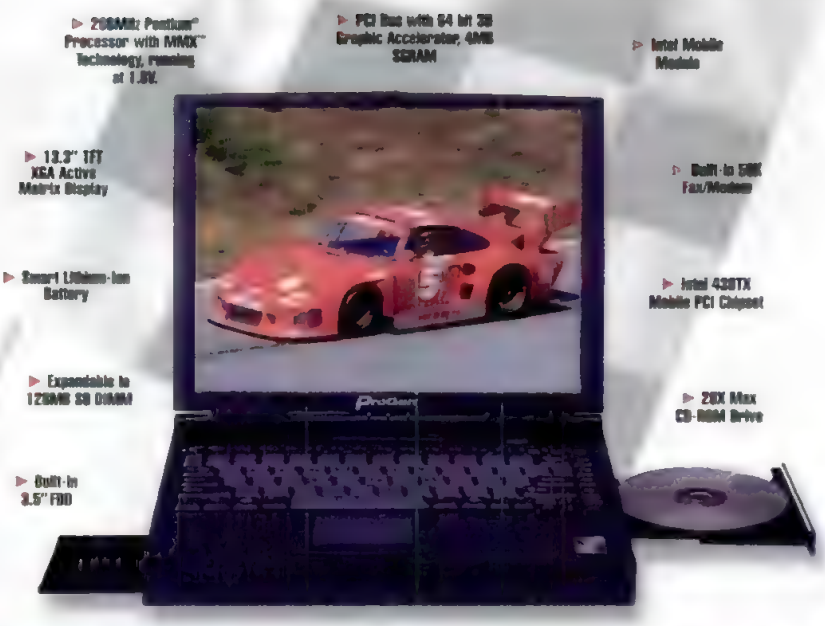

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THE TOP 100 WEB SITES

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BY TRACY KERIEVSKY

No longer a novelty, the Web is now being put to very good use.

Have you noticed how the Web is losing its "cool" factor? This is actually a very encouraging sign. Exploring the Web is no longer an end in itself; it's a means to an end, a way to find a vital piece of information, to buy a product, or to get something done.

Though our new list of the Web's best sites still includes plenty of entertaining destinations, we're struck by how *useful* so many of the sites on our top 100 are. If we're all going to start living the "Web lifestyle," the evolution will have to continue until we think of the Web the same way we think of the telephone—which is not at all. When we take the Web for granted, we'll know it has truly arrived.

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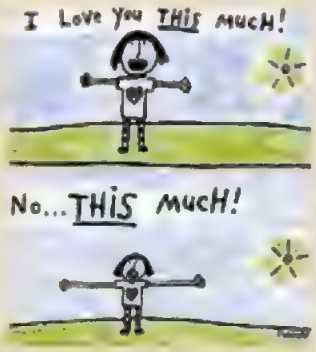

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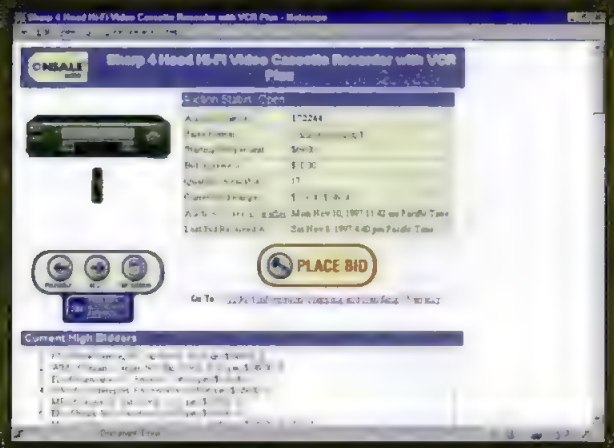

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THE INTERNET MALL

www.internetmall.com

Here's a way to consume voraciously without becoming a mall rat. The biggest physical mall in the world can't match The Internet Mall, with its 27,000 stores and brand names of every stripe. There are CDs, florists, computers, fashion, bikes, furniture, and even dental services. You can pinpoint items quickly by category or keyword. The Internet Mall also helps merchants move any product from their own sites with the OrderEasy shopping service, which spares them from having to learn complex commercial protocols. Merchants can just put a "Buy Now" button next to items that will link shoppers automatically to a secure shopping-cart system; shoppers can fill the carts all day as they browse at participating sites.

MICROSOFT CARPOINT

carpoint.msn.com

Car browsers will appreciate CarPoint's Surround Video, a unique and fun way of virtually exploring the interiors of 55 different models. The site also offers a wealth of buyers' resources and mature online tools that help you to pinpoint the best choice. New features include *Kelley Blue Book* pricing of used cars, used-car reliability ratings, side-by-side car comparisons, and a better finance calculator. The New Car Buying Service, a search facility similar to the one in AutoWeb, uses a car's make and a ZIP code to deliver a list of dealers in your area that stock the vehicle.

MICROSOFT EXPEDIA

expedia.msn.com

A travel site can never be too straightforward, and Expedia is now so streamlined that you can find the best airfare in just five clicks. Because the site remembers your credit card number, your nearest airport, and even your brother's frequent flier number, you can be in and out fast. The free service has always had a shrewd fare finder, a hotel and car reservations service, news and deep editorial coverage, a currency converter, weather information, maps, and discussions with experts taking questions. Now there is Fare Compare, which produces a handful of great deals to choose from. The site also has real-time flight tracking and an option that lets you choose your seat from a map of available seats. In the spirit of simplicity, you now have the means to build your itinerary on one screen, thus saving download time.

MICROSOFT INVESTOR

investor.msn.com

Investor will wow you with a state-of-the-art interface that lets you track your portfolio, read news pertaining to the stocks you hold, look up the historical performance of stocks and mutual funds, and tailor the charts and graphs to your specifications. Investor covers all the bases. You can also trade stocks through leading partners such as Charles Schwab & Co. and nine others, with more on the way.

MOVIELINK

www.777film.com

The Web is full of film sites, but MovieLink can really enhance your moviegoing experience by letting you purchase tickets via your PC. MovieLink is the online cousin of 777-FILM, so you can select a city, browse by theater, title, or genre, and get movie times. Tickets are just a few mouse clicks away, and they'll be waiting for you at the theater. Just be prepared to fork over some extra cash for the service charge.

MUSIC BOULEVARD

www.musicblvd.com

With best-selling CDs priced as low as $11.99 (not including shipping), Music Boulevard would earn our praise just for its prices, but there's much more going on here. The site is affiliated with both MTV and VH-1 to provide content and

Our Contributors TRACY KERIEVSKY is a staff editor and DON WILMOTT is the executive editor of PC Magazine Online.

context, and albums for sale are often accompanied not only by audio clips (in several formats) but also by links to articles and press releases. But what's really new and interesting is the e_mod system that Music Boulevard offers. After you download the e_mod player, you can buy CD-quality singles right over the Web for about 99 cents each. If you have a CD-R drive, you can even make your own compilation CDs. What you'll see here is the future of music distribution, so take a look.

NETGROCER

www.netgrocer.com

Would you ever consider doing your weekly grocery shopping online? Granted, the idea of having your staples delivered via FedEx is unconventional, but NetGrocer is so well conceived and executed that it's sure to make you rethink the way you shop. The site sells only nonperishables, and it lets you save lists to reuse later. A live cash register keeps a running tally as you order; you pay via credit card. Your groceries arrive in four days, and shipping is just $2.99 for the first 10 pounds and 99 cents for each additional 10 pounds. Buy more than $75 worth and delivery is free (for an unspecified limited time).

1-800-FLOWERS

www.1800flowers.com

Forget about buying flowers on the phone: 1-800-Flowers has pictures worth a thousand words, and your online purchase is worth 300 frequent-flier miles from United Airlines. Send those long-stems—or any of 149 other bouquets you can view online—24 hours a day; a local florist will process your order. Online shoppers enjoy a service-charge discount of almost 50 percent on all orders. This $300 million enterprise not only guarantees 100 percent satisfaction but also promises that flowers will stay fresh for seven days.

ONSALE.COM

www.onsale.com

250,000 fanatical shoppers can't be wrong: That's how many people have placed bids at the Web's leading auction house. If you're looking for a bargain in computing equipment or consumer electronics, check out the fast-paced action that is entertainment as much as it is shopping. Onsale works more like a stock market than anything else; you put in a bid and raise it later if competition builds. Razz your co-bidders with taunting messages as you up them by $25. Big bargains abound in this freest of free markets. Is this the way all shopping online will look in the future?

QUOTE.COM

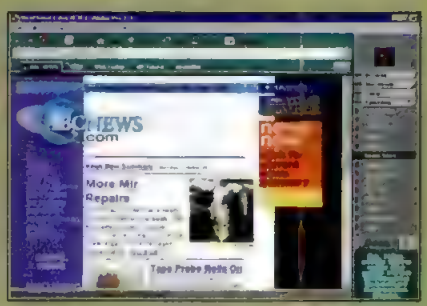
www.quote.com

Stock market investors can never have too much information. Quote.com helps bridge the gap between you and your broker, keeping you informed every second of the trading day. Although most of the services are fee-based—including real-time stock quotes—there's enough free data to make a difference. The site features live business news, earnings forecasts and reports, market analyses, annual reports, and company profiles. You can track multiple portfolios automatically and receive relevant news and stock-price alarms via e-mail. Onlive!'s real-time voice chat, Talker, and

Friendly Front Doors to the Web

Here are two new ways to help you make sense of the Web as you surf. **Snap! Online** (*www.snap.com*) is an Internet entry point created by cnet that feels like a combination of America Online and a Yahoo!-like Internet directory. Available from its own URL, as a premier channel of Microsoft Internet Explorer 4.0, or from seven Internet service providers that will use it as a home screen, Snap! Online packages the Web as a collection of 13 highly edited channels, each with its own headlines, stories, links, and search tools. As you explore News, Living, Sports, or Computing, for example, it's hard not be reminded of AOL's channels. The difference, of course, is that Snap! Online is on the Web itself and is free; it's not an online service that offers a gateway to the Web.

The colorful, somewhat frenetic home page promotes what's new on the channels each day, and a handy "week in review" feature lets you go back in time to see what was highlighted on the home page during the past week. Each channel has its own home page, complete with headlines, highlights, searching, and related links.

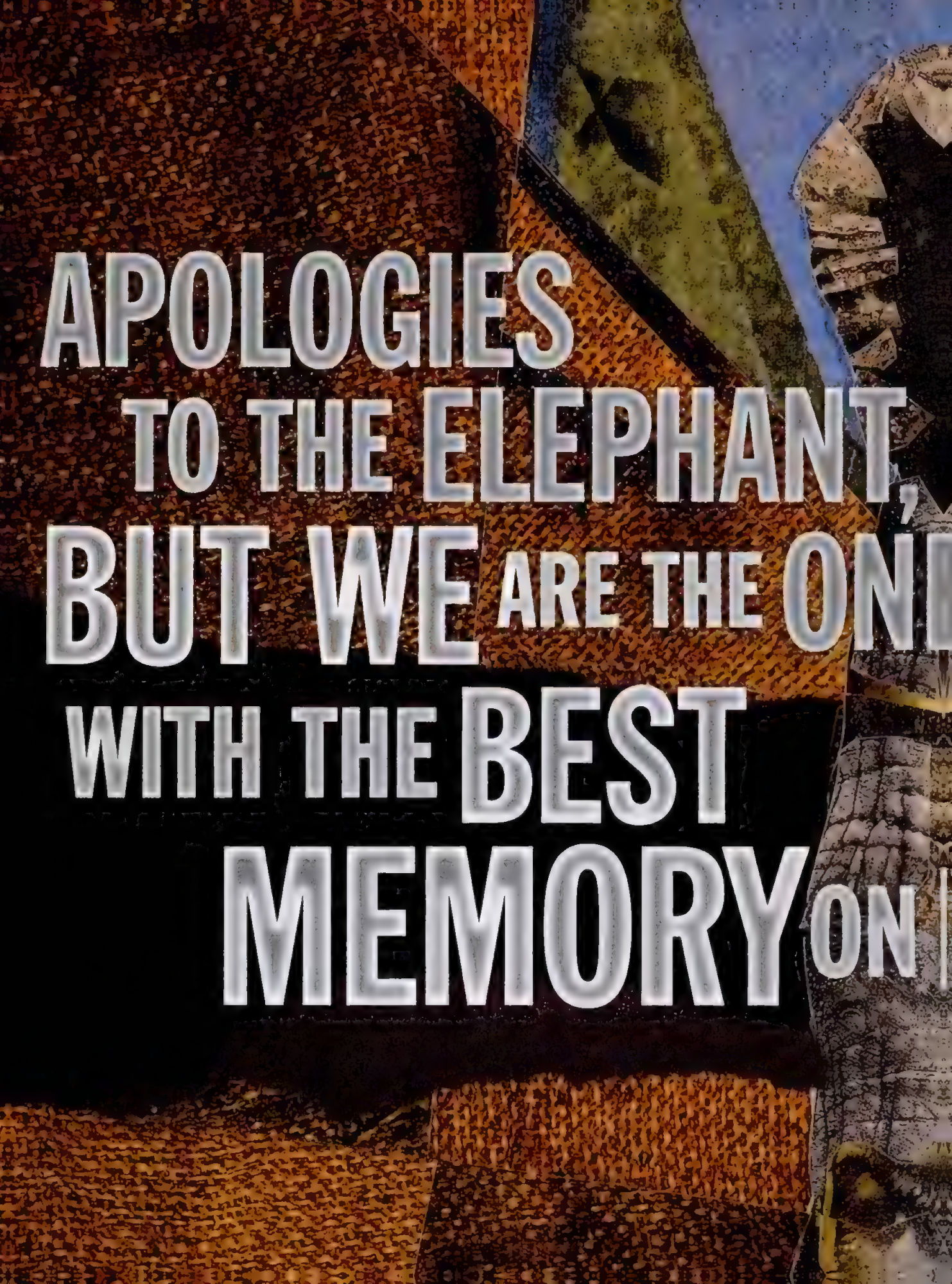


NeoPlanet's channel guide and tabs make it easy to see where you are.

Snap! Online asks only for your ZIP code; that way, it can customize itself to give you your local weather and lottery numbers. You can also pick stocks to watch and type in your birth date to get horoscopes.

NeoPlanet (*www.neoplanet.com*), from Bigfoot, is a more ambitious undertaking. A free 400KB downloadable applet that sits atop Internet Explorer 4.0, NeoPlanet also organizes the Web into a set of channels and subsections. But as you surf, you never leave the NeoPlanet interface, so it's always easy to find your way back to where you came from.

You can set up your own NeoPlanet channels and reorganize all the subsections any way you'd like. Customize it enough and NeoPlanet can be an extremely efficient way to check in at your favorite sites. It's also a great interface for Web novices who are unaware of the vast array of information that the Web provides.—*Don Willmott*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REEL
www.reel.com

Reel has grown by leaps and bounds. It was always a distinguished site, with a recommendation system that suggests movies based on how you rate a sampling of movies—though Reel goes beyond many other sites and reaches for "feel," "energy," and "creative matches." But now Reel has introduced a market where you can rent any of 35,000 titles for $4.50 per week plus shipping. If you rent five or more titles, each is even less. And 80,000 titles are available for sale at 20 percent off list price; some titles are under $10 each.

RENT NET
www.rent.net

When you have to find an apartment, don't leave the online stone unturned. Rent Net is the most visited apartment site on the Web, with a database of more than a million apartments in the 50 states and Canada. The site also has a clever feature called Total View 360, which lets you step in and walk around. You can specify your price range and desired amenities, then receive details and perhaps a floor plan and photo. You can also request listing updates by e-mail.

TRAVELOCITY
www.travelocity.com

Travelocity has an edge on most online travel sites when it comes to one all-important factor: prices. The exclusive "3 Best Itineraries/Low Fare Search Engine" turns up some startlingly low fares; though other sites make you root around for prices, Travelocity just tosses three low fares into your lap. In addition to chasing down deals among 700 airlines, the site pursues bargains at 34,000 hotels and 50 car rental companies, and when you find a price you like, you can do your booking right here. In addition, for those of you with alphanumeric pagers, Travelocity offers a free service that lets you know whether your flight is on time.

TRIPOD
www.tripod.com

Tripod is the preeminent virtual community of college students and recent college graduates trying to make their way in the world. The site has more than 300,000 registered members, each of whom can create a home page, get e-mail, and construct a résumé by using easy-to-follow forms. Tripod is like training wheels for real life. Chats are always available, and every day the site has articles about travel, politics, money, technology, and more. Extra home-page space is available for extra cost, but most of what Tripod offers comes for free: quite a bargain for young adults who probably don't have any money anyway.

VIRTUAL VINEYARDS
www.virtualvin.com

Never again will you have to confess ignorance in a wine shop. You'll pick up all sorts of knowledge from online proprietor Peter Granoff as you browse Virtual Vineyards for a crisp and lively bottle—or case (might as well, since you get a 10 percent discount by the case). If you really don't know wine, turn to Peter for recommendations: Many are under $15. Opt for Peter's instant picks or mixed samplers, or join the monthly wine program to receive reds, whites, or both along with tasting charts and notes. Your satisfaction is guaranteed, and with the help of the Food Dude, your gastronomic experience will be complete.

COMPUTING

BOTSPOT
botspot.com

A *bot* is any piece of software that performs a task for you in an autonomous manner. The BotSpot is devoted to everything bot-related. Here you'll find descriptions of new bots as well as a complete list of bots organized by function. If you're interested in bot technology, you'll find a list of resources that includes links to articles on bot topics, frequently-asked-questions lists, and software libraries. Of course, you can also have a bot notify you when the BotSpot site is updated.

BROWSERWATCH
browserwatch.internet.com

The browser wars aren't quite over yet, and until they are, BrowserWatch will be on hand to keep track of the latest and best browsers, plug-ins, and ActiveX controls. It's a great place to look for new versions, and it also has software downloads, usage stats, and extensive lists of plug-in and browser developments.

CISCO SYSTEMS
www.cisco.com

At first glance, this site appears to be just another boring corporate home page, but look a little closer: Cisco Systems, which supplies much of the infrastructure equipment that connects LANs to the Internet and keeps the Web humming, is notable for selling huge amounts of products online. This is much more than brochureware. Cisco clients come here to make big purchases in the MarketPlace, an online catalog crowded with dozens of Cisco networking products. Also available: a list of LAN-building seminars and information on how to become a Cisco partner.

C|NET
www.cnet.com

A splashy, well-designed site, c|net is rich with information on computing and on life in the digital age. Updated daily with everything from breaking technology news to product reviews to musings of the digerati, c|net livens up its colorful content with multimedia elements. It also produces shareware.com, a "virtual software library" where you can search through 190,000 shareware titles, and search.com, a convenient one-stop front end for dozens of major and minor search engines. The site also includes gamecenter.com, with reviews and news for video- and PC-game addicts.

DELL COMPUTER
www.dell.com

At $3 million in sales a day and climbing, Dell has one of the most successful sites of any PC vendor, but what really sets it apart is its nifty Customize/Buy Online feature, a natural extension of Dell's mail-order roots. You can run a price check on a variety of desktop, portable, or server system configurations, and when you've found your dream machine, you can purchase it online. Of course, Dell doesn't neglect the basics: You can research various product lines, download patches and new drivers, find out about upgrade options, and even check your order status online.

DEVELOPAGES
www.developages.com

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POWER PQ QUEST

get them? DeveloPages is a great place to go if you're creating almost anything. Using the site, you can get the names, telephone numbers, and mail and e-mail addresses of more than 12,000 companies involved in the creative process of product manufacturing. You can locate suppliers, source materials, and manufacturers, and you can find that elusive green plastic resin you've been searching for. On the flip side, if your company designs, builds, manufactures, renders, sells, or markets, you can use DeveloPages as a great networking contact.

DEVELOPER.COM

www.developer.com

This EarthWeb site contains several comprehensive Internet-related resources, of which the single best one is Gamelan (discussed below). In addition to Gamelan's Java coverage, Developer.com has sections covering such things as ActiveX and JavaScript as well as emerging technologies such as VRML. Each section has feature articles, news, and discussions, along with hundreds of examples of the technologies for you to explore. This is the kind of site that can keep you on the cutting edge of Web development.

56K.COM

www.56k.com

Have you been tempted by ads promising the Internet at 56 Kbps? Before you take the plunge, visit 56K.COM for a straightforward overview of the advantages and disadvantages of 56-Kbps modems. If you decide the technology is for you, then you'll find plenty of information to help you upgrade or purchase a new modem. Can your current modem be upgraded? Check the Upgrade Guide. There's also vendor-specific information on modem-initialization strings, drivers, and firmware upgrades. The Primer covers the basics of 56K modem technology and includes a glossary of connectivity terms, and you can keep track of 56K-related happenings in the Newsflashes section.

GAMELAN

www.gamelan.com

Got a craving for Java? Gamelan is sure to satisfy it with listings of over 4,300 Java applets and Java-related sites, including Castanet channels. EarthWeb's Gamelan is so impressive on the subject of Java that it deserves its own place on our list of best sites. Whether you're a Java developer or you just want to see some cool Java implementations, Gamelan is the place to go. You'll find categorized lists of Java applets and What's New and What's Cool sections to make your searches easier. A brief summary explains each applet and site. You can also read about and find sites and information on ActiveX and VRML. Once you're through browsing, you can chat with other visitors, too.

HOTWIRED

www.hotwired.com

The redesigned *Wired* magazine of the Web is as fresh and visually challenging as the print version of the digital-culture bible. HotWired delivers gossip in Ned Brainard's weekly Flux column, politics in the prickly Netizen section, and industry updates in Webmonkey. You can chat, find a job, or learn the latest tricks. Of course, you can also take a look at back issues of *Wired*, and you'll also find NewBot: Tell it your interests and it scours 100 newspapers on your behalf.

THE HTML STATION

www.december.com/html

This useful site provides a quick reference to HTML syntax as well as demonstrations of how HTML tags look online. Most basic HTML constructions are explained in the Demonstrations section. Look here for help on coding tables, frames, image maps, and forms. You can view the pages' source code to see how the examples were constructed. HTML specifications from Level 1 to Level 3 are covered in detail. The section called "HTML entities, codes, and types" contains useful quick references to things you'd normally look up in book appendixes. A list of HTML character codes, ASCII codes, color codes, HTTP status codes, and more are all listed here. In addition to HTML specifications, there are tuto-

The Dynamic HTML Toolkit

The 4.0 versions of Microsoft's and Netscape's browsers embrace Dynamic HTML, an enhanced version of HTML that transforms the static nature of a Web page by incorporating elements that change pages on the fly. The charm of DHTML is that even though the code comes from a remote site, the action takes place locally, on your PC, keeping performance up to speed. Here are sites that will teach you more about DHTML.

- **Dynamic HTML in Netscape Communicator**
  Netscape explains its implementation.
  developer.netscape.com/library/documentation/communicator/dynhtml/index.htm
- **Dynamic HTML Index**
  This well-organized list points to many resources.
  www.all-links.com/dynamic
- **Dynamic HTML Lab**
  New articles every two weeks from Webreference.
  webreference.com/dhtml
- **Microsoft Dynamic HTML Gallery**
  In order to view this site, you need to use Microsoft Internet Explorer 4.0.
  www.microsoft.com/gallery/files/html
- **Microsoft Site Builder: Dynamic HTML**
  Microsoft outlines its DHTML plans.
  www.microsoft.com/workshop/author/dhtml
- **Netscape Communicator Demonstrations**
  In order to view this site, you need to use Netscape Navigator 4.0.
  form.netscape.com/comprod/products/communicator/beta_features.html
- **Yahoo! HTML Sites**
  Yahoo!'s list of HTML sites and tutorials includes several Dynamic HTML links.
  www.yahoo.com/Computers_and_Internet/Information_and_Documentation/Data_Formats/HTML

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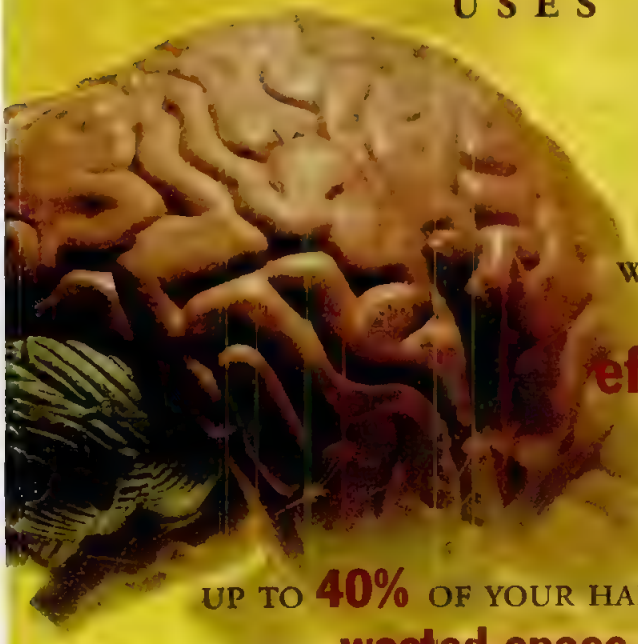

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MICROSOFT

www.microsoft.com

You can't say Bill Gates does anything halfway. Microsoft's site offers computer junkies a little bit of everything—actually, quite a bit of everything—and the site's repository is growing larger daily. You can learn all about the company's products, get corporate financial reports and stock updates, figure out how to order ISDN, browse technical-support libraries, learn to tackle tricky programming issues, and check out technology demos. You can also download free software, such as Microsoft Internet Explorer 4.0 and the latest ActiveX controls. One caveat: This site is always terribly slow.

NETCRAFT

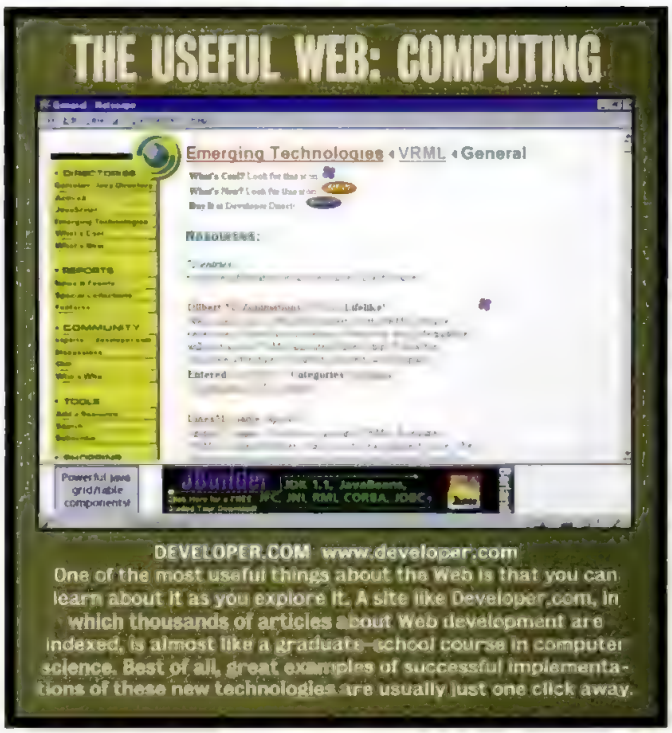
www.netcraft.co.uk

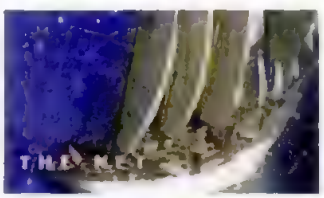
Netcraft doesn't look like much, and it doesn't do much, but what it does accomplish can be of great interest to Internet experts. Netcraft exists to deliver results from the Web Server Survey, a monthly report detailing how many Internet computers are running each brand of Web server software. The survey data is sorted into a variety of reports and tables and is accompanied by a brief analysis of what the numbers mean. You can also enter a host name to find out what server software is running on a specific site; doing so will add that site to the survey. The site also makes available a comprehensive list of Web server software developers and links to their home sites.

NETLINGO

www.netlingo.com

What's a *crapplet*? According to NetLingo, it's a "profoundly useless Java applet." This living dictionary is devoted to the often cryptic and comedic vocabulary of the Internet, which is evolving at record speed. Just browsing is diverting enough, and a scrolling ticker of entries entices you. But you can also look up hundreds of words. Besides definitions, you'll find links, examples, and technical sheets on syntax, limits, and usage. You can also keep a "pocket dictionary" on your desktop while you surf or submit lingo you've picked up.





NETSCAPE

www.netscape.com

Netscape's prime attraction has always been free software: You can check out a new prerelease version of the browser or some cool new plug-ins. You'll also find industry news; DevEdge, a fantastic fee-based subsite devoted to developer information; documentation on Netscape products and technologies and on the Internet in general; and even a store, where you can buy Netscape products and Mozilla souvenirs. And don't miss Netcenter, Netscape's own online Internet community.

THE PALACE

www.thepalace.com

If live chat is going to be the next big thing on the Web, then The Palace is going to be mighty big too. Of all the types of live chat you can try online, The Palace provides what may be the most entertaining interface. Though other chats have avatars and backgrounds, The Palace's are more colorful, more active, and more entertaining. This may not be the kind of chat that permeates serious corporate settings, but it's already popping up on plenty of entertainment sites; and here at the home site, you can get a taste of what this chat is like. (Softbank, the parent company of Ziff-Davis and *PC Magazine*, is an investor in The Palace.)

REALMEDIA DEVZONE

www.real.com/devzone/index.html

If you're considering adding RealAudio or RealVideo to your Web pages, check out RealNetworks' RealMedia DevZone, a must-visit site with all the tools, news, and technical details you'll need. The site has software from both RealNetworks and third-party providers, along with tools for encoding and editing both audio and video. There's a content-creation guide to help you capture, encode, and serve multimedia files. The RealMedia and RealAudio software development kits are available for download, as well as tools to help you integrate RealAudio and RealVideo functionality into ActiveX controls and Java applets. The Tip of the Week helps you get the best quality audio and video and embed the elements into your pages.

RSA DATA SECURITY

www.rsa.com

Although the Web is relatively safe, there are still numerous ways you can get scammed or your site can get hacked. RSA Data Security has created a site that covers a wide range of security issues, discussing commerce, e-mail, Java, and personal security. You'll find links to other articles about emerging encryption technology and standards that are being tossed around in the Web arena. Most important, in the Developer's Corner you'll find everything a Webmaster should know before designing a site, complete with mailing-list discussion groups, technical support, and links to recent security bulletins.

SEARCH ENGINE WATCH

www.searchenginewatch.com

New Internet search engines and metasearch sites are popping up all the time and getting more sophisticated. Search Engine Watch is devoted to helping Web developers get the most benefit from having their sites indexed and to helping end users choose an engine. The "Webmaster's Guide to Search Engines" tells you how the engines work, how best to tag your site for indexing, how to check your URL, and many important design considerations. "SpiderSpotting" will help you detect which engines have visited your site and how often. There's also a rundown of the major spiders and robots in use. The site gives search

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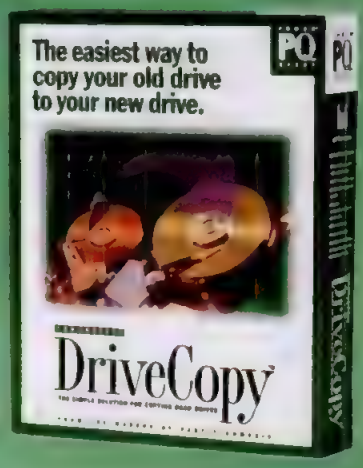

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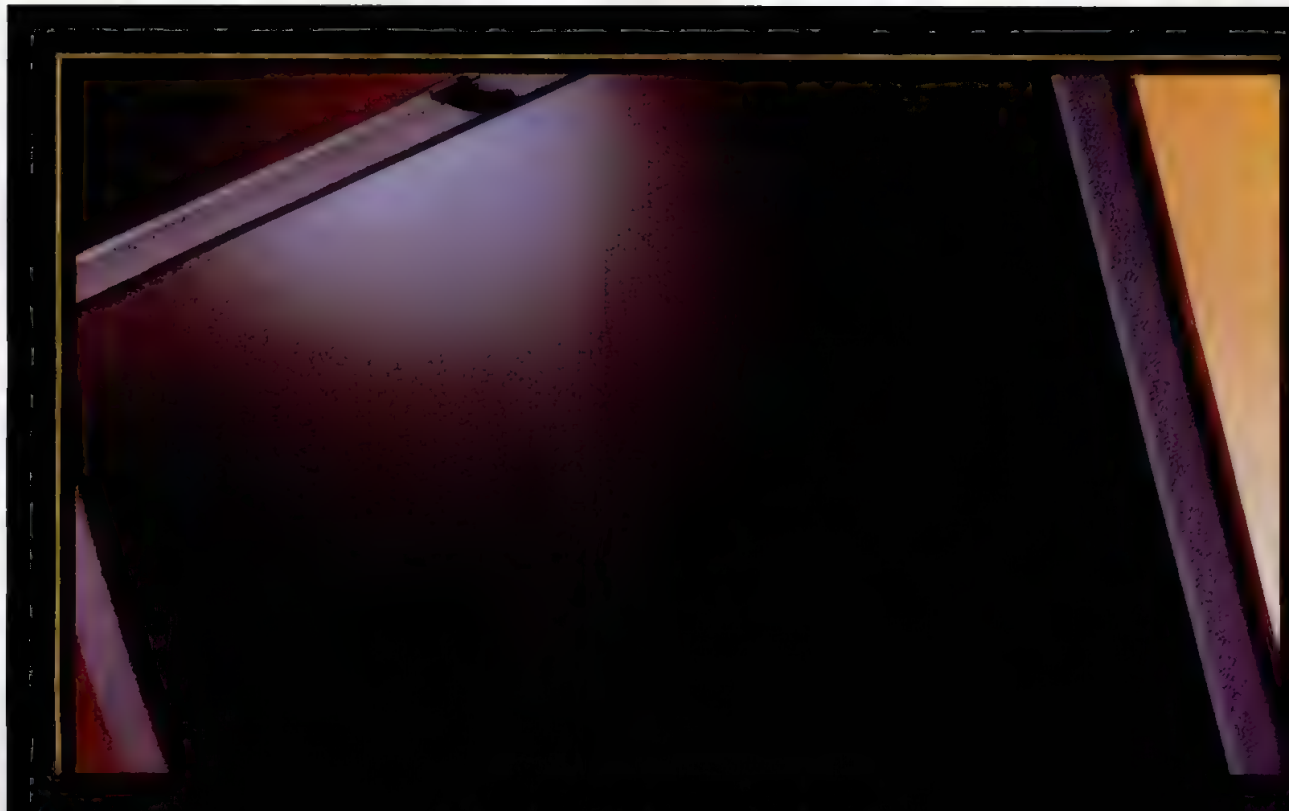

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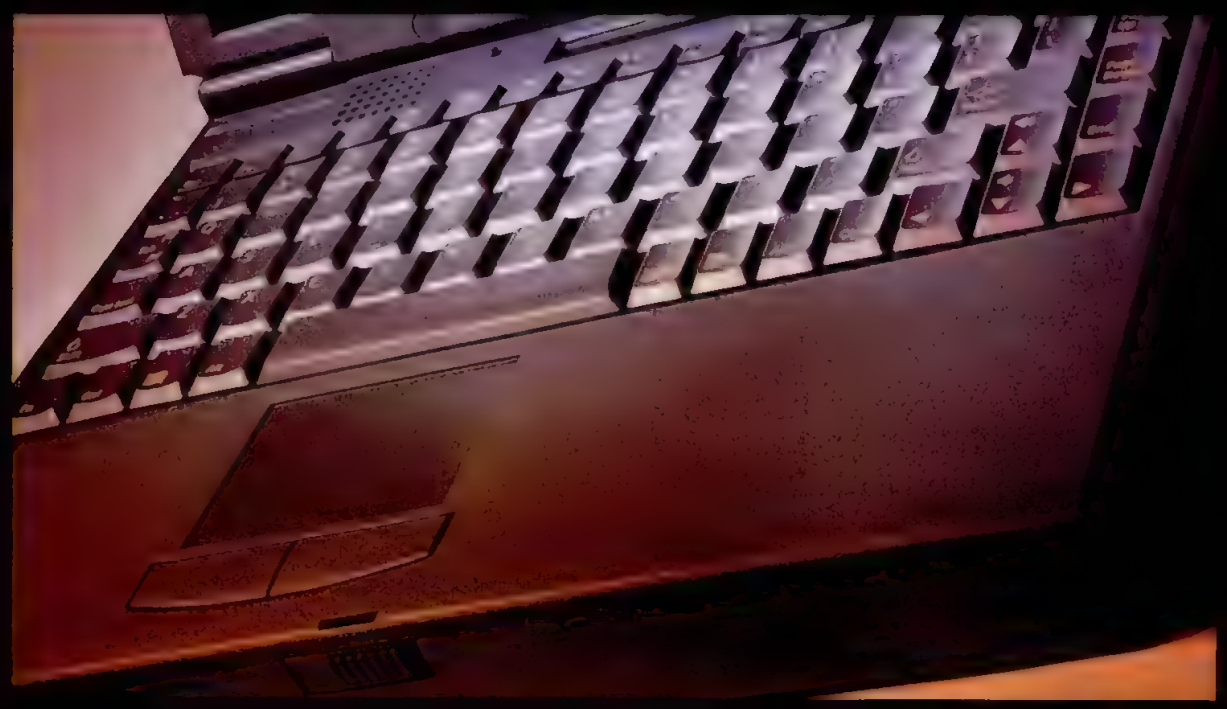

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www.hpresource.com/omnibook3000

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engine feature-comparison charts and summarizes alliances between the search sites and major content providers. The "Search Engine EKG" gives a graphical look at how often the search engines visit a particular site for indexing, which is useful for determining which engines are most up to date.

SILICON INVESTOR

www.techstocks.com

The stock pages are perfectly adequate for getting price quotes, but what if you want in-depth information on your investments? Despite a lot of self-serving posts, Silicon Investor offers great discussion groups for technology stocks. Also, you can make use of Silicon Investor as an online broker that produces charts and comprehensive stock profiles for you. This is a good accessory to the financial section of a newspaper, and since the information is free, just take the money you save in brokerage fees and put it back into the market.

STROUD'S CWSAPPS LIST

www.stroud.com

Looking for a hard-to-find utility? Not sure which plug-ins are the best? Stroud's Consummate Winsock Apps List catalogs hundreds of Windows-based utilities and Internet tools, offering ratings (and often full reviews) in addition to such information as version numbers, file sizes, required operating systems, and prices. You can scan the top 25 downloads of the past two weeks and flip through descriptions of every 16- or 32-bit application. Everything is presented in an easy-to-scan, table-based design. The site is updated nearly every day, so it manages to stay remarkably current despite the can't-keep-up nature of the Net.

SUN MICROSYSTEMS

www.sun.com

The Java technology pioneered by Sun has had a caffeinating effect on Webmasters' imaginations, making for some interesting Web pages. Keep abreast with the latest news and breakthroughs in the effort to make platform independence a reality. And who can forget that Sun hardware still lurks behind the scenes at many of the Web's most popular spots? You'll find not just hardware specs and details but also extensive lists of practical tips and tricks to help keep a site running at its peak.

SUPPORTHELP.COM

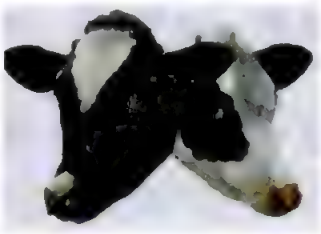
www.supporthelp.com

Say you've got a problem with your scanner or your serial bus, but you've lost your manual and don't know the customer service hot-line number? Visit SupportHelp.com, where you'll find links to company home pages, technical-support sites, phone numbers, and e-mail and snail-mail addresses for more than 2,500 vendors. You can search alphabetically or find out whether a Usenet newsgroup exists to help you.

TUCOWS

www.tucows.com

The Ultimate Collection of Winsock Software offers exhaustive lists of Winsock-compliant freeware and shareware for Windows 3.1 and Windows 95, plus Macintosh software for die-hard Mac fans. You can browse by application type or product name; for each tool, TUCOWS offers a version number and revision date, file size and location, price, brief description, and a 1- to 5-cow rating. If you're dying to know when the newest version of your favorite utility arrives, you can subscribe to a mailing list that will keep you apprised of updates. And with more than 100 mirror sites on nearly every continent, you'll never have to worry about waiting too long for a download.



TUNEUP.COM

www.tuneup.com

How's this for a smart idea? Tuneup.com provides Internet users with access to the latest in drivers, antivirus software, computer publications, DLLs, disk optimization, automatic file storage and retrieval, and driver updates, and gives users expert answers to PC questions. Put it all together and package it at a cut-rate price ($4.95 a month) and you've got one hot power users' site.

WEBREFERENCE

www.webreference.com

Only a handful of sites are must reads for people with more than just a passing interest in the Web, and Webreference is one of them. No matter your level of expertise, you'll find plenty of topics to get you started on creating content and building a better site. You'll never want for new information with the site's extensive coverage on topics such as Web authoring and Java implementation. There's a Developer's Corner and a JavaScript Tip of the Week, as well as plenty of job postings for anyone looking to work in a Web-related field. Internet lovers will think they've died and gone to heaven.

THE WORLD WIDE WEB CONSORTIUM

www.w3.org

W3C is an international consortium devoted to guiding the evolution of the Web. The group seeks to develop open, technologically sound specifications to enhance the Web's user interface and architecture. It also looks for ways to address the Web's societal issues with technology. The W3C Reference Library (Libwww) is a general-purpose Web API written in C. It can be used as the code base for writing Web clients, servers, and proxies. Libwww provides reference code for HTTP and other Internet protocols as well as for handling many media types, including HTML. Members have access to new versions a month before the public does, so you may want to see if your organization is part of the consortium.

ZDNET

www.zdnet.com

ZDNet offers the vast resources of more than a dozen Ziff-Davis computer magazines and newspapers (including *PC Magazine*). The latest innovation is a collection of almost 50 guides devoted to specific product categories and Internet topics. The site's comprehensive NetBuyer section helps you shop for the latest products and access weekly specials and side-by-side comparisons. You'll find daily breaking news from *PC Week* and ZDNet News, analyses, product and game reviews by the thousands, a huge shareware library, and unique online-only content from premier writers and columnists. With ZDNet's LearnItOnline, you can get comfortable with major packages like Microsoft Office on your own time at your own desk; for $29.95 per year, you get unlimited access to unique bite-size tutorials that offer interactive simulations of software environments. Whether you're looking for a scanner review or are eager for industry insight, ZDNet is unbeatable.

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COMEDY CENTRAL

www.comcentral.com

"South Park," "The Daily Show," and "Dr. Katz": Some of the funniest TV content around is on Comedy Central, and the Web site is downright hilarious too. Every show has its own subsite, and they all come with fun interactive games to play. Challenge Ben Stein and try to win his money. See if you can answer five questions better than the celebrities who struggle to look smart on "The Daily Show." You won't be disappointed if you spend a few minutes at the only Web site around that dares to call the attorney general Janet "Damn It" Reno.

CUISINENET

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No matter how much the snootiest critics rave about a restaurant, it may not have what you really like on the menu. CuisineNet has complete menus, photos, and ratings of restaurants in Atlanta, Baltimore, Boston, Chicago, Dallas, the District of Columbia, Houston, L.A., New York, Philadelphia, and San Francisco. The beauty of CuisineNet is that it's not some weird, arbitrary cross section of restaurants: Because CuisineNet is a free service, it doesn't have only paying advertisers' menus. (If your favorite restaurant's not here, you can have the owner call CuisineNet's 800 number and get its menu online.)

E! ONLINE

www.eonline.com

The recent recipient of a great Hollywood-style face lift, E! Online is still keeping pace with Tinseltown's seismic shifts, with stellar columns, gripping gossip from Ted Casablanca, celebrity profiles, and discussion forums where average Joes can, for example, describe their own celebrity encounters. Investigative features dig deep while shallow celebrities talk about this and that in the chat rooms.

EPICURIOUS

www.epicurious.com

Epicurious has three features as simple and as brilliant as a perfect soufflé: *Gourmet*, *Bon Appetit*, and *Condé Nast Traveler* magazines. The result is the Web's best site for gourmet recipes and glamorous travel. This recipe source doesn't tell you what you want to cook: You tell it. A search for mashed potatoes will come up with not only the milk-and-butter version but also so many bedeviling interpretations that you may be inspired to greater heights, such as "warm mashed potato and Swiss chard terrine." If you don't know where to start, you can turn to the What's Ripe report. Then leave your worldly woes behind: Epicurious Travel has hundreds of destinations for those with discriminating tastes.

INTERNET MOVIE DATABASE

www.imdb.com

The IMDB is the single best film resource on the Web. With information on more than 120,000 movies, a 1,750,000-entry filmography, and listings of hundreds of thousands of actors, actresses, and crew members, you can search for anything and you'll never be disappointed. Recent search improvements let you construct more complex queries to get even more specific details for your own video film festivals.

THE MINING COMPANY

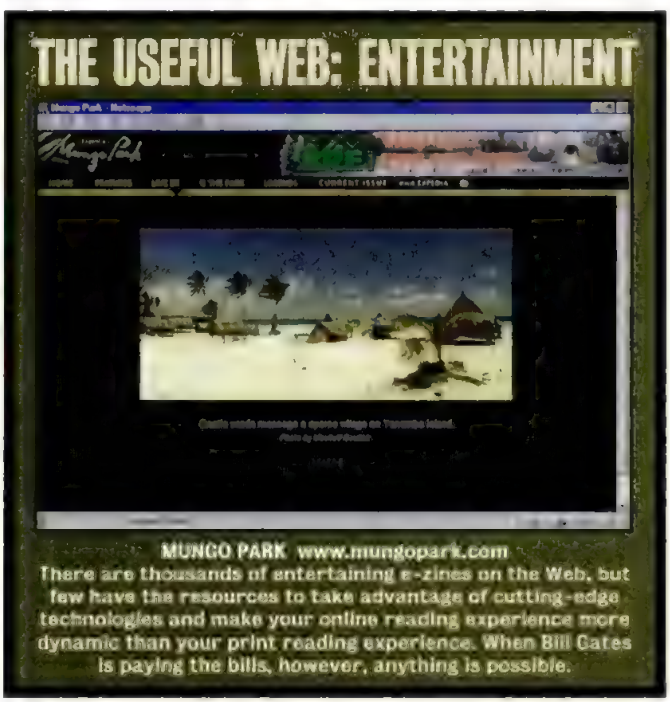
www.miningco.com

Here's a novel approach to indexing and cataloging the best of the Web: Why not ask real human beings with real expertise to take responsibility for particular categories and keep them cataloged and up-to-date? At The Mining Company, you can suggest a category. If you become its official guide, you'll get paid for your troubles, depending, of course, on how much traffic you generate. So far, there are more than 500 guides in about a dozen top-level categories.

MR. CRANKY RATES THE MOVIES

www.internet-plaza.net/zone/mrcranky/index.html

Okay, so he's predictable. But Mr. Cranky's extremely negative film reviews are also extremely funny: He rates on a scale ranging from one bomb to a bundle of dynamite, and his two cents can save you up to $9. For instance, Mr. Cranky didn't like *Contact*: "I guarantee that you'll be looking at your watch about two hours into this thing wondering when Jodie is going to get in the pod." But he preferred it to *L.A. Confidential*, of which he said that "Hollywood is incapable of setting a film in L.A. where someone doesn't run off with the hooker-with-a-heart-of-gold in the end."



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MR. SHOWBIZ
www.mrshowbiz.com

It's got more competition than ever, and its founding editor has left for greener pastures, but Mr. Showbiz is still the place to go to get gossip, box-office numbers, music charts, and more. Try CelebSite, where searching for your favorite star is as easy as typing a name. You can gleefully spend time at the Water Cooler settling questions such as "Would you refuse to attend *Lolita* because of its pedophilic subject matter?"

MUNGO PARK
www.mungopark.com

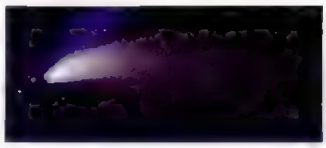
Microsoft scored a coup when it landed renowned adventurer Richard Bangs as editor of its online travel magazine. Mungo Park is a remarkable site that uses every available cutting-edge Web technology including audio, video, and surround video to let you tag along on a monthly expedition to some far and exotic corner of the world, be it the coast of Newfoundland or the deepest river canyon in Ethiopia. World-class writers provide daily insights during the trips, and celebrities often go along too. One recent example: Dr. Ruth on the prowl in Papua New Guinea.

MYLAUNCH
www.mylaunch.com

MTV Online is beautiful but shallow. Unfurled is surprisingly sparse. When it comes to music on the Web, we have an eye on MyLaunch, a site that evolved from the CD-ROM–based magazine *Launch* last October. With the purchase of Firefly Network's huge database of music recommendations, MyLaunch is a personalized site. When you join up, you give the site as much information as you can about your musical tastes. From then on, the opening screen will reflect the news, album reviews, and concerts that you'll be most interested in. You can rate any CD you see and start virtual friendships with others who share your musical tastes. (Softbank, the parent company of Ziff-Davis and *PC Magazine*, is an investor in 2Way Media, the parent company of MyLaunch.)

NASA
www.nasa.gov

Put a touch of the cosmos into your daily life with the Astronomy Picture of the Day, and if you dare, venture into the vast and incredible space that is NASA. NASA is one of the largest entities on the Web, which is both the site's strength and its weakness: The array of information, images, and databases is overwhelming. Fortunately, you can search for information on a specific topic. How do you become an astronaut? Talk about your ideas with a NASA scientist or e-mail an astronaut? Get an astronaut to speak to your child's class? Get a pass to see a launch? The answers are here.



THE ONION
www.theonion.com

Every week, The Onion creates hilariously phony news with headlines like "Alzheimer's Sufferers Demand Cure for Pancakes." And if you like throwing truth to the wind in the spirit of fun, you will devour stories like "Tobacco Companies Ordered to Pay $800B in Camel Cash" and "Learning Channel Switches to All-Gilligan Format ('To hell with learning,' says spokesperson)." Aren't you at all curious to know how "Massive Oil Spill Results in Improved Wildlife Viscosity" or why "ACLU Defends Nazis' Right to Burn Down ACLU Headquarters"?

PARENT SOUP
www.parentsoup.com

Parents, are you making it up as you go? You could ask for advice from your teenager (who claims to know everything), or you could turn to a community of other parents struggling with curfews, adoption, divorce, toddlers, school-related issues, and single parenthood. Parent Soup has interactive chats, a searchable library, and advice that will ease your mind and give you a dose of reality.

PBS ONLINE
www.pbs.org

Sneak onto the Net today and don't feel guilty about it: Surfing PBS is good for you. This site, really dozens of sites in one, expands all of the shows it offers to the laugh-track–weary. Join in the debate at "NewsHour with Jim Lehrer." PBS Online has transcripts, essays, and RealAudio presentations in addition to live forums. "Nova" helps science teachers in the classroom. You can follow archeologists into the chambers and passageways of pyramids. "Sesame Street" characters are also on call. And the recent redesign offers utterly clear navigation that makes surfing PBS time well spent.

THE ROGUE MARKET
www.roguemarket.com

Serious students of pop culture can find out just how smart they are at The Rogue Market, an entertaining virtual stock market that trades in celebrity status. Take 10,000 virtual dollars and buy stock in Leonardo DiCaprio, Cameron Diaz, and Fiona Apple. Then watch as their fortunes rise and fall, along with those of 1,200 other cultural icons in 30 categories, from golfers to fashion designers. Remember to buy low, sell high, and pray that one of your picks lands on the cover of *People* magazine and not on the cover of *The National Enquirer*.

SALON
www.salonmagazine.com

Salon is one of the few must-read e-zines on the Web. Daily columns on the media, music, books, and the news are incredibly well written and insightful, and big names frequently contribute to Wanderlust, the site's travel section. Technology watchers will enjoy 21st, the site's look at future trends, and articles and interviews about society, art, and film—not to mention comics, games, and the Surreal Gourmet—are guaranteed to keep you interested.

TV GUIDE
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When the number-one magazine in America offers its TV listings, interviews, and news online and adds a couple of interactive twists, it's worth a bookmark. *TV Guide*'s online TV area has personalized viewing grids based on your ZIP code, regular e-mail reminders when your favorite old movies are being broadcast, and a search capability for TV categories and actors. But the site goes further, offering some nicely assembled information on movies, music, and sports.

YOU DON'T KNOW JACK
www.bezerk.com

The online version of Berkeley Systems' wild and edgy trivia game plays just like the CD-ROM version. You'd never know you were on the Web as the hilarious host guides you through very funny, nutty rounds of trivia. Play alone or against an opponent, with new sessions every Monday and Thursday. And there are commercials, but they're fun, too.

ZAGAT GUIDE
www.pathfinder.com/Travel/Zagat/Dine/index.html

Zagat's restaurant guides are popular because they echo the voice of the people, with extensive surveys of frequent diners. The online version covers 36 cities with Zagat's trademark witty remarks, which always make researching restaurants fun in itself.

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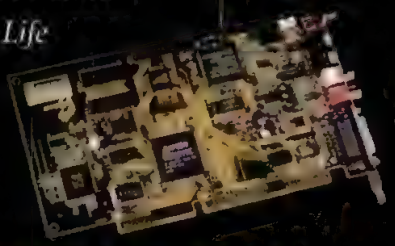

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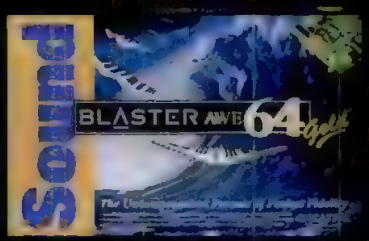

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ABCNEWS.COM

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ABC was late to the online news game, but the wait was worthwhile. In a relatively short time, ABC has built a site that scrolls the headlines, offers special online-only features from international correspondents, and delivers just the right amount of video to accentuate the latest-breaking stories. Instant polls pop up often, and links out to all of ABC News's shows keep you updated on future topics.

CNN INTERACTIVE

www.cnn.com

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CNN/SI

www.cnnsi.com

Sports fans just can't get enough stats, and now they have another fire hose of data from which to drink. CNN/SI, the Web counterpart to the growing cable competitor of ESPN, is jam-packed with the usual up-to-the-minute results, and it's also extremely deep on history and reference. Want full stats on any major league baseball player who ever lived? All 15,000 are here. Want to browse through the video library? Go ahead. Want to tune in to live video of breaking sports stories? That's here, too. With bulletin boards, fantasy leagues, and personal scoreboards, you can customize to get news on your own favorite teams and sports.

ESPNET SPORTSZONE

espnet.sportszone.com

SportsZone is at the top of its game. Although you have to pay to take advantage of its services, the site offers all that its cable-TV cousin does: scores, stories, stats, schedules, standings, video, and sound. The daily, up-to-the minute analyses and features help keep you on top of everything from the NCAA Run to the Final Four to the Stanley Cup playoffs. You'll also find one of the most popular office pastimes available online: fantasy leagues that let their members live vicariously through their heroes as never before.

INTELLICAST

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Intellicast is raining on The Weather Channel's parade. Though Intellicast's ads are more intrusive, its site has a more sensible interface with less backward and forward clicking. And if you want to know if it's snowing in Minsk or steamy in New Orleans, just click on the map to get specific radar and satellite information. Look no further for ski reports, travel forecasts, and an intriguing almanac that breaks the weather down by 12 months and 11 regions: Read this and you'll understand why you're sweating (or shivering) today.

THE LOS ANGELES TIMES

www.latimes.com

Of course *The Los Angeles Times* has hard-hitting headlines, but it also does a bang-up job of covering the entertainment and media industries. You can dig down from the headlines to the full news stories; search through two years' worth of movie reviews; find restaurant reviews based on cuisine, neighborhood, price, and rating; and follow your favorite teams' schedules with Game Tracker. Searchable classifieds are here too. And the paper gives you star treatment: You can customize a page by choosing topics that interest you, and related news will be waiting for you when you log on.

MERCURY CENTER

www.mercurycenter.com

Good morning, Silicon Valley. Your *San Jose Mercury News* has been arriving online longer than any other newspaper, with much praise. By now, the Mercury Center, as the online version is called, knows a thing or two about delivering news digitally. Its motto: Don't treat it like paper. The Mercury Center builds its nonlinear approach on links that make the news a personal quest. You get today's edition and the full text of all papers going back to 1984 (more than one million stories), news about all the Bay Area sports teams, and a renowned technology section.

MSNBC

www.msnbc.com

MSNBC is the most interactive news site at the moment, closely allied with the MSNBC cable channel but setting out to create features specifically for the Web medium. The site also complements its TV counterpart in interesting ways: When you view an MSNBC piece on hazardous waste, you can go to the Web site to see if you have waste in your neighborhood. There's also a personalized news page that delivers a custom page to your screen. MSNBC is way ahead of CNN and ABC when it comes to polls, chats, and discussions, many of which tie into daily coverage on the cable channel. This expansive site makes news make sense on the Web.

THE NANDO TIMES

www.nando.net

It was one of the first online newspapers, and it's still one of the best. The Nando Times, based on the *Raleigh News & Observer,* knows how to construct a rewarding newspaper experience on the Web. In addition to a winning presentation of all the latest world, national, business, entertainment, and technology news, you can also install the Java-based Nando News Watcher,

Quantex is right for your business. Just check our resume.

QUANTEX

Objective Provide businesses with high-performance, reliable PCs that include unique advanced support features like QSentry Technology.

Major Accomplishment

The successful incorporation of QSentry Technology, a unique, customized PC health monitoring and support technology (based on Intel's LANDesk Client Manager V.3.1) into all Quantex desktops. This exciting technology:

- Maintains inventory of system hardware and software
- Automatically detects and notifies users of potential PC hardware problems
- Pinpoints problems and informs users of possible troubleshooting remedies to consider
- Reduces a business's total cost of ownership by eliminating costly downtime and lost productivity
- Supports industry initiatives and standards: Wired for Management, DMI-2.0, SNMP
- Simplifies local and remote network management of desktop client PCs

Honors and Achievements

Winner of *Computer Shopper's* 1997 Direct Channel Achievement Award
Chosen over all other direct vendors including Gateway, Dell and Micron, Quantex took home *Computer Shopper's* 1997 Award for Systems. This prestigious award recognizes Quantex's commitment to providing customers with high-performance systems at competitive prices and backing them with a solid business support package.

Winner of *PC Computing's* 1997 Most Valuable Product Award
Beating out industry-leading competition, Quantex took home the esteemed 1997 *PC Computing* MVP Award. Quantex was awarded this honor after *PC Computing's* editors conducted an exhaustive review of thousands of computer hardware and software products, evaluating them for usability, performance, technology, innovation and value.

Winner of *PC Magazine's* Editors' Choice Award - QP5/233 M-3
In December 1997, Quantex's QP5/233 M-3 grabbed *PC Magazine's* coveted Editors' Choice Award. This award recognized our ability to deliver systems with the highest levels of reliability, cutting-edge performance and overall value.

In the last three months of 1997 alone, Quantex has accumulated **6 Best Buy** awards from *PC World*, a **PowerUser's Bargain** recommendation from *Windows Magazine*, a **Buy It!** from *C-Net Online*, a **Best Desktops 1997** selection from *NetBuyer*, an **Honorable Mention** from *PC Magazine*, a **Lab Runner-Up** award from *Home PC* and an **Editors' Choice** award from *PC Magazine (U.K.)*.

nces and Additional Information

1. Hundreds of thousands of satisfied Quantex customers
2. Quantex Business Consultants at (800) 346-6572
3. The Quantex web site at www.quantex.com

MMX™ intel inside pentium® PROCESSOR

Business Desktops

Options: Zip 100MB Internal Drive w/one cartridge...$89 • Business Audio Kit (Sound Card & Altec Lansing ACS-90 Speakers)...$49 • HP LaserJet 6L Printer...$379 • MS Natural Keyboard...$39 • APC Back-UPS 280...$99 • APC Back-UPS 400...$129 • APC Back-UPS 600...$229

QP5/166 SB-1 $1099
(with MMX™ Technology)

Business lease: $39/Mo.

- 166MHz Pentium® Processor with MMX™ Technology
- 2 Universal Serial Bus (USB) Ports / DMI 2.0
- 16MB EDO Memory / 512KB Pipeline Burst Cache
- 2.1GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
- [illegible] with 2MB SGRAM
- 15" Digital Monitor (14.0" viewable)
- **3COM PCI 10/100 Fast EtherLink XL w/RJ-45**
- 24X Max EIDE CD-ROM Drive
- Quantex Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 95 with MS Plus
- 3 year limited warranty with 1 year On-Site Service**
- 24-hr./7-day Technical Support
- **QSentry Technology** *(including Intel LANDesk Client Manager V.3.1)*

QP5/200 SB-1(with MMX™ Technology)...**$1149**
QP5/233 SB-1(with MMX™ Technology)...**$1199**

QP6/233 SB-2 $1699
(featuring Pentium® II processor)

Business lease: $59/Mo.

- 233MHz Pentium® II Processor
- 2 Universal Serial Bus (USB) Ports / DMI 2.0
- 32MB Memory / 512KB Secondary Cache
- 4.3GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- STB Nitro 3D with 4MB SGRAM
- 17" Digital Monitor (16" viewable)
- **Choice of 3COM PCI 10/100 Fast EtherLink XL w/RJ-45 or K56flex protocol Fax/Modem***
- 24X Max EIDE CD-ROM Drive
- Quantex Tower Case
- 104-Key Keyboard with MS IntelliMouse
- MS Windows 95 with MS Plus
- **MS Office '97 Small Business Edition**
- 3 year limited warranty with 1 year On-Site Service**
- 24-hr./7-day Technical Support
- **QSentry Technology** *(including Intel LANDesk Client Manager V.3.1)*
- *Upgrade to Windows NT Workstation 4.0 for $99*

QP5/200 SB-2(with MMX™ Technology)...**$1499**
QP5/233 SB-2(with MMX™ Technology)...**$1549**

QP6/266 SB-3 $2049
(featuring Pentium® II processor)

Business lease: $72/Mo.

- 266MHz Pentium® II Processor
- Intel 440LX PCI Chipset / DMI 2.0
- 2 Universal Serial Bus (USB) Ports
- 64MB SDRAM Memory / 512KB Secondary Cache
- 6.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 128-bit Riva 128 3D AGP Graphics Card with 4MB SGRAM
- 17" Digital Monitor (16" viewable)
- **Choice of 3COM PCI 10/100 Fast EtherLink XL w/RJ-45 or K56flex protocol Fax/Modem***
- 32X Max EIDE CD-ROM Drive
- ATX Case
- 104-Key Keyboard with MS IntelliMouse
- **MS Windows NT 4.0 Workstation**
- **MS Office '97 Small Business Edition**
- 3 year limited warranty with 1-year On-Site Service**
- 24-hr./7-day Technical Support
- **QSentry Technology** *(including Intel LANDesk Client Manager V.3.1)*

QP6/233 SB-3(w/ Pentium® II Processor)...**$1949**
QP6/300 SB-3(w/ Pentium® II Processor)...**$2199**

QP6/300 SB-4 $2499
(featuring Pentium® II processor)

Business lease: $87/Mo.

- 300MHz Pentium® II Processor
- 2 Universal Serial Bus (USB) Ports/ DMI 2.0
- 64MB SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
  (Call for upgrade to 9GB UW SCSI 3 Drive w/ Adaptec 2940UW SCSI Controller)
- 3D Labs Permedia 2 AGP Graphics Card with 8MB
- 19" Digital Monitor (18.1" viewable)
- 32X Max EIDE CD-ROM Drive
- ATX Case
- 104-Key Keyboard with MS IntelliMouse
- **MS Windows NT 4.0 Workstation**
- **MS Office '97 Small Business Edition**
- 3 year limited warranty with 1-year On-Site Service**
- 24-hr./7-day Technical Support
- **QSentry Technology** *(including Intel LANDesk Client Manager V.3.1)*
- *Upgrade to 3COM PCI 10/100 Fast EtherLink XL w/RJ-45 for $89*
- *Upgrade to K56flex protocol Fax/Modem* for $69*

QP6/233 SB-4 (w/ Pentium® II Processor)...**$2249**
QP6/266 SB-4 (w/ Pentium® II Processor)...**$2349**

Word 97 · Excel 97 · Outlook 97 · Publisher 97 · Small Business Financial Manager 97 · Automap Streets Plus — **Microsoft Office 97** Small Business Edition

Business Notebooks

Options:
PCMCIA NIC...$129.00
Deluxe Carrying case...$99.00

Quantex H 1210 $2399
(with MMX™ Technology)

Business lease: $84/Mo.

- 200MHz Pentium® processor with MMX™ Technology
- Intel Mobile Module (I.M.M.) Architecture
- 12.1" SVGA Active Matrix Display
- 32MB SDRAM (expandable to 144MB)
- 512KB Pipelined Burst Cache
- 2GB HD / 3.5" 1.44MB Modular Floppy Drive
- PCMCIA K56flex protocol Fax/Modem*
- 20X Modular CD-ROM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows 95
- Corel Office Suite 8
- Carrying Case
- 24-hr./7-day Technical Support
- 3-year limited warranty on CPU and Main Memory
- 1 year parts and labor limited warranty on all other components
- *Add a Mini-Docking Station for only $169*
- *Add a 2nd Lithium Ion Battery for only $169*

H 1210 w/166MHz Pentium® processor w/MMX™ Technology.....**$2299**

Quantex H 1331 $3799
(with MMX™ Technology)

Business lease: $124/Mo.

- 266MHz Pentium® processor with MMX™ Technology
- Intel Mobile Module (I.M.M.) Architecture
- 13.3" XGA Active Matrix Display
- 64MB SDRAM (expandable to 144MB)
- 512KB Pipelined Burst Cache
- 4GB HD / 3.5" 1.44MB Modular Floppy Drive
- PCMCIA K56flex protocol Fax/Modem*
- 20X Modular CD-ROM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- 2nd Lithium Ion Battery
- Mini-Docking Station
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows 95 or Windows NT Workstation 4
- MS Office '97 Small Business Edition
- Carrying Case
- 24-hr./7-day Technical Support
- 3-year limited warranty on CPU and Main Memory
- 1 year parts and labor limited warranty on all other components

Power Multimedia Series

QP6/300 SM-4x $2549
(featuring Pentium® II processor)

Business lease: $89/Mo.

- 300MHz Pentium® II Processor
- 64MB SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 3D Labs Permedia 2 AGP Graphics Card with 8MB
- 19" Digital Monitor (18.1" viewable)
- K56flex protocol Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max EIDE CD ROM Drive
- Ensoniq 32 Bit Wavetable Sound Card
- Altec-Lansing ACS 90 Speakers with ACS-250 subwoofer
- ATX Tower Case
- 104-Key Keyboard with MS IntelliMouse
- MS Windows 95 with MS Plus!
- Power Multimedia Software Bundle
- Microsoft Office '97 [illegible] Edition
- 3 year limited warranty with 1-year On-Site Service**

QP6/233 SM-4x(w/ Pentium® II Processor)...**$2299**
QP6/266 SM-4x(w/ Pentium® II Processor)...**$2399**

QP6/300 SM-4x SE $2749
(featuring Pentium® II processor)

Business lease: $96/Mo.

- 300MHz Pentium® II Processor
- 64MB SDRAM Memory / 512KB Secondary Cache
- 8.4GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 128-bit RIVA 128 3D AGP Graphics with 4MB SGRAM
- 19" Digital Monitor (18.1" viewable)
- K56flex protocol Fax/Modem* w/Voice Mail and Speakerphone
- Toshiba 2nd Gen. DVD ROM Drive w/DVD Decoder Board
- Ensoniq 32 Bit Wavetable Sound Card
- Altec-Lansing ACS 490 Speakers with subwoofer
- ATX Tower Case
- 104-Key Keyboard with MS IntelliMouse
- MS Windows 95 with MS Plus!
- Power Multimedia Software Bundle
- Microsoft Office '97 Small Business Edition
- 3-year limited warranty with 1-year On-Site Service**

QP6/233 SM-4x SE(w/ Pentium® II Processor)...**$2499**
QP6/266 SM-4x SE(w/ Pentium® II Processor)...**$2599**

Software: MS Office '97 Small Business Edition • MS Money '97 • Office Mate • Day Planner Pro • Power Business Plans • Form Designer • Project Manager Pro • Labels Unlimited • Compton's Reference Collection • Dr. Solomons Anti-Virus • MS Internet Explorer 4.0

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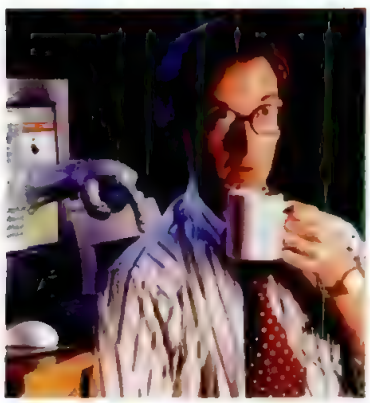

QSentry Technology is like having a full-time tech expert in your Quantex PC, alerting you to possible hardware problems before they become critical.

OVERALL RANKINGS
Technical Support Survey

PC VENDOR	GRADE
Quantex	Excellent
Dell	
IBM	
Compaq	Good
Gateway 2000	
Micron	
Acer	Fair
Toshiba	
Digital	Poor
Packard Bell	

Windows Magazine, 6/97

Award-Winning Technology

Our promise to you and your business extends well beyond our competitive prices. Selecting Quantex means your company will benefit from a broad range of reliable, high-performance systems. By including Windows NT, Microsoft's most powerful business desktop operating system, we increase productivity and reduce computing costs for businesses of all sizes. Windows NT also enables companies to run the latest, most powerful 32-bit multimedia and productivity applications up to 24% faster than they could with Windows 95. Enhancements like Pentium® II processors, AGP technology and Ultra ATA hard drives provide lightning-fast performance on all intensive applications. No other machine provides world-class performance and reliability like a Quantex does.

Advanced PC Monitoring & Support

Now incorporated into our business desktops, our new QSentry Technology allows us to take PC support to yet a higher level. This unique, customized PC health monitoring and support technology automatically detects potential hardware problems and notifies users, so hazards can be remedied before it is too late. By decreasing costly downtime and increasing productivity, QSentry Technology helps to reduce the total cost of PC ownership. It also ensures that our systems are compatible with industry standards and initiatives such as Wired for Management and DMI 2.0.

Award-Winning Service & Support

Every Quantex system is backed by our #1-rated, award-winning warranty and service package, specifically designed for growing businesses. It encompasses everything from pre-sale consulting to post-sale assistance and includes 24-hour/7-day toll-free technical support, express parts replacement, on-site service** and an optional 3-year extended warranty program. In fact, in a recent customer survey conducted by Windows Magazine, we were rated "Excellent" in our ability to handle technical problems quickly and inexpensively, and we excelled with a 91% "buy again" rating.

Award-Winning Value

In order to provide our customers with a lower total cost of PC ownership, we offer a lot more than simply an attractive price. We give our business customers extras like expert business consulting to assist in choosing the right solutions, an award-winning service and support package, QSentry Technology, online ordering, business leasing, volume discounts, fax-back services and more. All of this, in addition to our reliable, high-performance systems, makes up the outstanding value that you can only get from Quantex.

MMX intel inside pentium® PROCESSOR

Quantex. When It Comes To Helping Your Business, We Mean Business.

Choose 074 at www.pcmag.com/infolink

NICs On Board

With a factory-installed 3Com NIC, our partners' systems get you onto the network – fast.

Out of the box onto the Network

By purchasing desktop systems, notebooks or servers with 3Com Network Interface Cards (NICs), PC Cards or modems pre-configured and pre-installed, you'll be saving time and configuration hassles.

As the world's networking leader with over 100 million network connections, 3Com has set the pace in network solutions. Now we're partnering with leading computer manufacturers, resellers and distributors to bring you 3Com Network Ready™ systems equipped with the finest NICs, PC Cards and modems available. These systems are pre-configured, stringently tested and certified for complete compatibility with current network environments. And with Parallel Tasking® performance, DynamicAccess™ software, TranscendWare™ network management and x2™ technology, 3Com interface products offer the highest performing options on the market today.

3Com NETWORK READY

For a complete list of 3Com Network Ready Partners, call us at **1-888-906-3COM, ext. 105** or visit our website at **www.3com.com/networkreadypad2**. Get onto the network faster by buying a system with a 3Com card inside.

Ask for 3Com Network Ready systems today.

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which will constantly deliver the latest headlines to your desktop.

THE NEW YORK TIMES

www.nytimes.com

The best thing about the online version of *The New York Times* is CyberTimes, a special section focusing on technology and the Internet. If you're hunting for a job or apartment, the expansive, searchable classifieds section is still one of your best bets. Check out the forums in which you can discuss burning issues with fellow readers and the newspaper's staff. And yes, puzzle fans can play an interactive version of the famous crossword puzzle. New York Times Books carries news of the book world daily, and you also get an archive of more than 50,000 book reviews.

THE RED HERRING

www.redherring.com

Venture capital is the lifeblood of Silicon Valley, and knowing both who's handing it out and who's getting it is pivotal to success in the ultracompetitive high-tech world. Enter *The Red Herring*, a magazine that serves as the bible of venture capital. In The Red Herring online, you'll find late-breaking news of initial public offerings, a fascinating Entrepreneur's Resource Center that acts as an online coach for budding billionaires, job listings, company profiles, and other essential information for ambitious high-tech idea brokers in startup mode. (Softbank, the parent company of Ziff-Davis and *PC Magazine*, is an investor in The Red Herring.)

U.S. NEWS ONLINE

www.usnews.com

We like U.S. News Online, and not just for the online extras that augment the weekly news magazine's print coverage. We're also impressed by .edu, a spinoff of U.S. News's annual Best Colleges Guide, designed specifically to help nervous high schoolers get the lowdown on the colleges and universities they may want to attend. No other single college and graduate-school guide online has this much information easily accessible and cross-referenced.

THE WALL STREET JOURNAL INTERACTIVE EDITION

www.wsj.com

The Wall Street Journal Interactive Edition goes beyond the printed page by doing what no paperboy can: It brings you the complete Journal as early as midnight. But the Interactive Edition also takes advantage of the Web by continually updating reports and personalizing news and quotes. It lets you dig for background in its archives, access a finance glossary, link to related information such as full government reports and court rulings, explore "briefing books" on companies, see the highlights from the Asian and European editions, and interact with other readers and the news staff. Your first two weeks are free, then a subscription is $49 a year and $29 for print subscribers.

THE WASHINGTON POST

www.washingtonpost.com

As more people get connected to the Internet, sites devoted to politics are becoming more influential. Check out The Washington Post for inside-the-Beltway action and the nation's reactions. The Post online has all the regular paper's coverage but is briskly alive with interactive features. You can get local news by clicking on your state, read the first chapters of 130 books, check a business glossary, and scan a Federal Job Finder

REFERENCE

AMERICAN MEMORY

lcweb2.loc.gov/ammem/

The Library of Congress continues to dazzle us with exhibitions drawn from its seemingly infinite archives. American Memory is an ever-changing showcase of pictures, documents, sound recordings, and other resources, all curated by experts who sometimes write introductory essays to create a museum-like experience. Recent efforts include a collection of memories of 19th-century California and an amazing collection of turn-of-the-century film clips in downloadable formats. Another don't-miss section: The Detroit Publishing Co.'s collection of thousands of photographs of towns and cities taken between 1880 and 1920. Search for your own hometown, and be glad that at least some of your tax dollars are going to such noble efforts.

ANSWERS.COM

www.answers.com

How many languages does the Pope speak? You suspect that the answer is out there on the Web somewhere, but is it really worth your time to try to find it? Why not pay someone to do the research for you? Send in your question to Answers.com and a member of its team of expert Internet researchers will get your answer within 24 hours. You pay from $1.79 to $11.99 (via credit card), depending on the question's difficulty, and if the research is going to take longer (and cost more), Answers.com will ask you whether it should keep on looking. You can even hire it for larger, more complex research projects. The site comes with $8 worth of credit, so you can try it out and see just how smart the Answers.com experts are.

BIGBOOK

www.bigbook.com

Are your fingers tired of doing the walking? BigBook helps them find a service in a snap. This comprehensive collection of over 11 million U.S. businesses lets you find specific services anywhere in the country. BigBook also gives you nationwide street maps, third-party reviews, and customer ratings of businesses with which you might be unfamiliar—features you definitely won't find in your dog-eared Yellow Pages. In addition, you can build a personal phone book for easy access to numbers you frequently call.

CITYSEARCH

www.citysearch.com

CitySearch can take a metropolitan area where more than a million people work and play and simmer it down to a rich little melange on the Web. Currently, you can get phenomenally detailed content for Austin, Nashville, New York City, Pasadena, Portland, Salt Lake City, San Francisco, Toronto, and North Carolina's Research Triangle. The site creates a perfect thumbnail sketch of each city from a native's viewpoint, all the way down to school lunches and volunteer programs. It's battling with Microsoft Sidewalk in key markets, but it's holding its own quite nicely.

CYBERATLAS

www.cyberatlas.com

If you're interested in unearthing data about the dynamics of the Internet and its users, the place to start is CyberAtlas: The Internet Research Guide. This cleanly designed site offers loads of statistics and summaries of information from a variety of market research sources, supplemented by concise and thoughtful analyses. The site, designed in the shape of a compass,

What you discuss
in your meeting
is your business.

COMMUNICATE

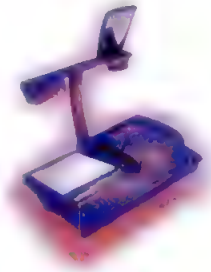
The 3M™ Videoconferencing System VCS3000 makes face-to-face communication easy.

CAPTURE

The 3M™ Ideaboard IB3000 accurately saves and shares meeting notes.

COLLABORATE

The 3M™ Dataconferencing System DCS3000 quickly shares information between teams separated by distance.



CONNECT

The 3M Meeting Network is a complete professional resource for more productive meetings.

How much you accomplish is ours.

Introducing 3M Advanced Meeting Solutions. As your business evolves, it's our business to help you communicate better and accomplish more in your meetings. That's why we're introducing a new family of easy-to-use, innovative products and resources designed to improve group communication and increase meeting productivity. With this new family of solutions, we're strengthening our commitment to provide you with superior products and information for your meetings. To receive more information about 3M Advanced Meeting Solutions, call **1-800-952-4059** or visit us at **www.3M.com/meetings**

Make the meeting.

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helps you find any needle in a haystack of data. Demographics, new market developments, modems, and software: It's all here for the asking. The site also provides a FAQ section and a glossary for those new to the Net.

FINANCENTER

www.financenter.com

What use is financial advice when its written for everyone to read? You need customized information. FinanCenter's interactive calculators answer your questions about borrowing or buying. Should you lease or buy the car? Will it pay to refinance your home? With calculators for credit cards, retirement, stocks, bonds, mutual funds, cars, and homes, you can experiment with your money—without the presence of a loan officer or sales rep—and calculate the option that will cost the least in the long run.

LAW.NET

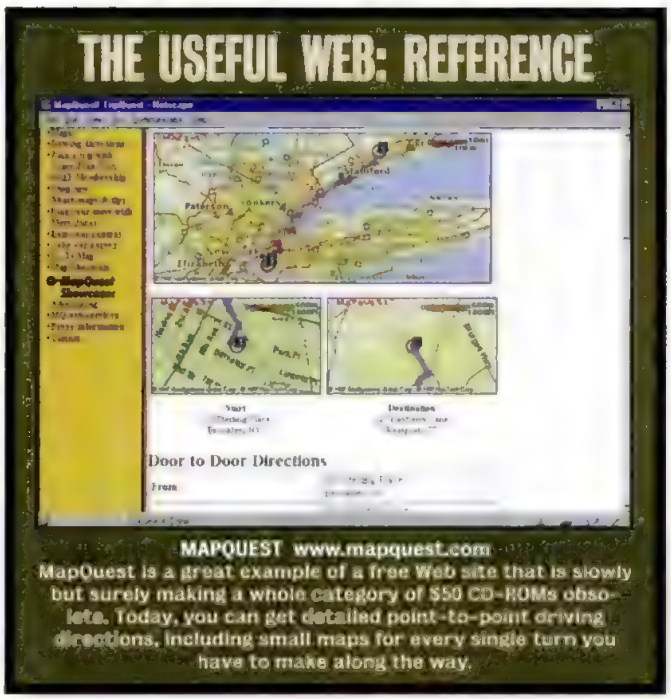
www.law.net

Did you hear about the new microwave lawyer? You spend 8 minutes in his office and get billed as if you'd been there 8 hours. Happily, Law.Net doesn't charge fees at all, and it's actually useful for both lawyers and laymen. Curse lawyers all you want, but the day will come when you can't get a hold of one fast enough, and Law.Net will be there. Law.Net provides the legal industry with a means of advertising (starting at $50 per month with a $100 setup), so you can locate legal facts or an attorney in this extensive directory of the Internet.

MAPQUEST

www.mapquest.com

At this point, a lot of people have heard the name Mapquest and can't get by without online mapping and routing. In addition to directions, maps, and yellow-page listings, Mapquest has routes to and from street intersections and airports and European and Canadian information, too. You can also cruise around cities and towns via Marimba's Castanet tuner, which brings you MapQuest without requiring you to download an applet every time. Just download the Interactive Atlas once, then select it when you visit to view information instantly.



MAPQUEST www.mapquest.com
MapQuest is a great example of a free Web site that is slowly but surely making a whole category of $50 CD-ROMs obsolete. Today, you can get detailed point-to-point driving directions, including small maps for every single turn you have to make along the way.

MICROSOFT SIDEWALK

www.sidewalk.com

Even though Microsoft Sidewalk arrived late to the online city-guide party, and even though it's available only for Boston, Denver, Minneapolis, New York, San Francisco, and Seattle so far, the service is notable both for its look and for its content. While some in the anti-Microsoft crowd complains that they don't want Bill Gates telling them where to eat in their own hometowns, the truth is that Microsoft has hired strong local talent to compile and edit listings and review restaurants, and what they don't create themselves they license from good local sources like the Manhattan Users' Guide in New York. Special features such as Seattle's cool real-time traffic report and New York's block-by-block tours entice users to come back frequently. Microsoft asks, "Where do you want to go today?" Sidewalk asks, "Where do you want to go tonight?"

THE MONSTER BOARD

www.monsterboard.com

Why not hunt for a job at home in your pajamas? Online employment services are quickly expanding to include non-technology fields. Monster Board helps you start the flow of paychecks or fill your company's ranks. The U.S. jobless rate has hit a six-year low, but there are 50,000 jobs to be had at Monster Board across all fields and levels. You can search Monster Board's database by location (in the U.S. or abroad) and company; create a resume and apply for jobs directly on the site; and research employers.

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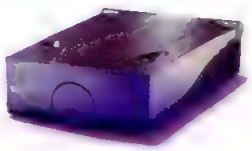

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CROSSING THE THRESHOLD

Digital Cameras

PC Labs tests 29 affordable entries for business and home.

By Daniel Grotta and Sally Wiener Grotta

$500 DIGITAL CAMERA
The more affordable digital cameras (like the Canon PowerShot 350) offer VGA image resolution (640-by-480). This is good enough for Web photos and small prints.

35-MM FILM
Traditional print photos are still the standard against which digital-camera images are compared. Image quality is clearly better from film; digital has the advantage of instant images.

It's easy to understand the booming business that digital camera manufacturers are doing these days. The host of easy-to-use personal and business publishing applications, the dramatic expansion of the Web and its insatiable appetite for visual images, and the proliferation of inexpensive printers capable of photo-realistic output make a digital camera an enticing add-on. Those factors, combined with improving image quality and falling prices, put the digital camera on the cusp of becoming a standard peripheral for a home or business PC.

In fact, more than 2 million digital cameras were purchased in 1997; the devices outsold conventional 35-mm single-lens reflex cameras for the second year in a row. The vast majority of those purchased were entry-level point-and-shoot cameras costing less than $1,000, for which three overlapping market segments have emerged: family, business, and semi-professional users.

REVIEW CRITERIA

For this roundup, we tested portable digital still cameras that offered at least VGA resolution (640 by 480 pixels) and cost less than $1,000 on the street. A camera had to be new to the market since our roundup a year ago ("Heave-Ho, Silver!", January 7, 1997), though we invited back past Editors' Choice winners to see how they compared to the newer competition.

Two years ago, in our first digital camera roundup ("Digital Cameras: The Death of Film?", February 6, 1996), we set the same sub-$1,000 price ceiling. We received a grand total of six products; none of them exceeded VGA resolution, and the image quality they produced was only fair to poor. Last year, the number of digital cameras in this market segment had doubled. The majority of them provided VGA resolution, though three units offered higher resolutions. Overall, image quality had improved somewhat, ranging from fair to good.

This year 29 digital cameras from 19 manufacturers met our review criteria. There has been an explosion of new products, as many film camera, scanner, and PC peripheral manufacturers have rushed to tap into this rapidly expanding market. In addition to those that were ready for our roundup, another 50 entry-level cameras have been announced or are under development—not including more than a score of midrange cameras and professional high-end units, which vary from about $1,200 to over $26,000.

PHOTOS&A PH BY DAVID MCGLYNN; STYLIST: ANGIE ARNETT; MODEL: JENNIFER BAUMGARDNER

$800 DIGITAL CAMERA

Moving up the price scale brings higher resolution (such as the 1,024-by-768 of the Epson PhotoPC 600). Image quality is more suitable for business presentations and real-estate sales.

$900 DIGITAL CAMERA

Entering the megapixel domain (such as the 1,152-by-864 resolution of the Kodak DC210) images improve vastly. Such high-res images are good for sales and marketing materials.

$300 DIGITAL CAMERA

The lowest-priced digital cameras (like the HP PhotoSmart) are fine for family-fun projects, such as e-mailing photos to relatives, but image quality lags behind more expensive devices.

There are no engineering or performance standards to which every camera adheres, despite (or perhaps because of) the number of products available in a relatively new market. This veritable free-for-all is great for innovation, as camera manufacturers develop novel solutions for keeping prices down while boosting performance and the functionality that suits the intended users. The downside is wide variability in performance, features, and operation.

THE TARGET MARKETS

Families are doing what they have always done—taking pictures of each other, their travels, their weddings and parties, their babies, and their pets. But now they are using those pictures for custom-designed cards and calendars, which they print on their ink jet printers, include in e-mail letters to grandma, and even place in their personal Web pages.

For families, the primary concern is to know that they have decent pictures at affordable prices. And with digital cameras still much more expensive than comparable point-and-shoot film cameras, the convenience, ease of use, and immediacy must provide some incentive for deciding against the alternative: snapping a traditional photo, having it developed, and scanning it into the PC on one of the new breed of low-cost color scanners.

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Visit our Web site to see **actual image samples** from the 29 cameras we tested.

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Right now, the truly affordable digital cameras ($400 to $600) still ask you to trade image quality for the convenience of instant images. Cameras in this price range have limited resolving power—typically VGA resolution. This level is fine for images that users will view on-screen only (such as Web site images) or for 3- by 5-inch prints from the family ink jet printer. Enlarge a VGA image, however, and you will start to see *pixelization* (that is, you'll see the individual picture elements as squares); the image will also lack subtle detail.

The bottom line: If you're looking for the best image quality, stick to film and purchase a photo or flatbed scanner ($99 to $400) for your PC. But high-end consumers and PC hobbyists who are ready to accept the image trade-offs may find a whole new outlet for their creativity with digital photography.

Business users have more to gain from digital photography than home users. The technology lets the user put a photo onto the computer monitor within minutes of shooting, translating into a huge productivity enhancement and a valuable competitive edge. Digitally captured photos are going into presentations, business letters, newsletters, personnel ID badges, and Web- and print-based product catalogs. Moreover, niche business segments that have relied heavily on traditional photography—such as real-estate agents (for photos of properties) and insurance adjusters (for documentation of claims in the field)—now embrace digital cameras wholeheartedly.

For the typical business user, image quality and accuracy may be more important than the cost of the camera: The time and money savings in cutting out film processing make a $700 to $1,000 camera a good investment. Business users who need digital images just for in-house use may be satisfied with VGA-class cameras. If the photos are for outside consumption, however, you'll want to step up to 800-by-600 resolution or higher. You'll also want to look for special features, such as voice annotation of images and the ability to load images into the camera's memory and replay them on any TV for presentations.

For the first time, entry-level digital cameras are making inroads into semiprofessional photography. Higher resolutions (up to 1,280-by-960) and the resultant better picture quality, plus the ability to set f-stops and shutter speeds manually, make doing the job personally attractive for in-house photographers. Although these cameras cannot assure professional-quality compositions or poster-size enlargements, they are quite capable of producing excellent images for Web pages, newsletters, and even printed enlargements up to 8 by 10 inches.

NEW TRENDS IN A GROWING SEGMENT

A handful of entry-level digital cameras are still available with sub-VGA resolution, such as the $199 Eastman Kodak DC20 (512-by-384) and the $399 Nikon Coolpix 100 (512-by-480), and most now have at least VGA resolution. Six of the units we tested offer at least megapixel resolution (XGA, or 1,024-by-768), among them three of our four Editors' Choices: the Agfa ePhoto 1280 ($899 list), the Eastman Kodak DS DC210 Zoom Camera ($899 list), and the Olympus D-500L ($900 street).

Although higher resolution doesn't necessarily translate into better images—

SUITABILITY TO TASK

Only a year ago, most of the sub-$1,000 entry-level digital cameras were suitable only for quick image captures for business uses such as real-estate sales, insurance claims, and employee IDs. More affordable cameras have since emerged for family users, while better units have been introduced that may interest photo hobbyists and semiprofessional photographers.

To be a suitable camera for the **family**, a camera has to offer image quality good enough that home users won't be disappointed with their snapshots. Affordability is an important factor, as are ease of use and a good software bundle. It's a plus if the camera vendor offers a companion printer you can hook up directly to the camera.

For **business** users, memory capacity and a removable memory option are important for long days of shooting in the field. A camera should offer good image quality in automatic mode, so users needn't waste time playing with settings. Intuitive software to get images to the applications where they are needed is a must. Video-out capabilities, so the camera can be used as a presentation device, are a plus.

Semiprofessional photographers will need the best image quality available in the entry-level segment. The camera should also offer advanced adjustments (such as control over f-stops and shutter speeds) so the knowledgeable photographer can capture the best image under a range of conditions. Fast recovery time and large memory capacity will enhance productivity.

Our Contributors: DANIEL GROTTA and SALLY WEINER GROTTA are contributing editors of *PC Magazine* and the authors of *Digital Imaging for Visual Artists* (McGraw-Hill). BRUCE BROWN, ALFRED POOR, and M. DAVID STONE are also contributing editors, and JAMES KARNEY is a frequent contributor. JAMIE M. BSALES was the associate editor in charge of this story, and technical director NICK STAM was the project leader.

picture quality also depends on the quality of the lens and image-capture chip, compression algorithms, and other components—image quality was in fact considerably better this year, generally ranging from good to very good. And this improvement comes at prices that are sometimes several hundred dollars less than a year ago.

Another welcome trend is the increasing inclusion of a color LCD panel to serve as viewfinder and playback screen. In fact, only 5 of the 29 digital cameras in this roundup don't have one. These panels can be useful for accurately framing shots at arm's length, and they let you see captured images instantly so that you know whether the pictures are keepers or should be deleted and shot again. But although an LCD is a convenience, it depletes battery life quickly. We recommend that you look for a digital camera that offers a traditional optical viewfinder in addition to the LCD (as 9 units in this roundup do), so that you can opt to forgo the display on long shoots.

Another positive trend is the greater ease of image transfer: There are more ways of getting images out of the camera and into your PC. Two years ago, all the digital cameras we tested saved images to built-in flash memory chips. To download pictures into a computer, the user had to tether the camera by cable to a PC's serial port—a slow and sometimes tedious process. That approach also greatly restricted the number of shots users could take without receiving a "memory full" message and having to dump images to a computer before shooting again.

Although five of this roundup's devices still rely solely on built-in memory, the majority can save to removable memory cards: They can use PC Card flash memory or one of the three new miniature cards: the CompactFlash, MiniatureCard, or SmartMedia. Memory cards are like rolls of film in that you can replace them when they're full. The advantages are that you can reuse them over and over; swapping the cards is faster than rewinding and reloading a roll of film in a traditional camera; and like a roll of film, a typical 2MB memory card holds 36 medium-quality images. The miniature cards slip into adapters that you can insert into any PC Card (PCMCIA) slot, an ideal approach

Editors' Choice

- Family: Canon PowerShot 350/Konica Q-mini
- Business: Kodak DS DC210, Olympus D-500L
- Semiprofessional: Agfa ePhoto 1280

For home users and PC hobbyists looking for affordable, easy-to-use cameras with acceptable image quality, our Editors' Choices are the Canon PowerShot 350 and the Konica Q-mini (each $500 street). These virtually identical units both deliver 640-by-480 resolution and features not yet standard at this price point: built-in flash with red-eye reduction, swivel 1.8-inch color LCD, CompactFlash removable memory, and video-out capability. Given the resolution, images taken outdoors were excellent, with good color saturation. Indoor shots with the flash were among the best we saw at the price. The Yashica KC 600 ($500 street) deserves honorable mention in this category. This unit, with a resolution of 640-by-480, delivered fine picture quality (though not quite as good as our winners), and it also has a host of features and an intuitive software bundle.

Looking good: The Olympus D-500L.

For serious business-productivity chores, two cameras merit our Editors' Choice: the Eastman Kodak DS DC210 Zoom Camera ($899 list) and the Olympus D-500L ($900 street). These high-resolution megapixel cameras offer some of the best image quality available for less than $1,000, and their features make them handy business tools. The DC210 uses CompactFlash memory cards and sports a 2-inch LCD. The menus, written in understandable English, make the unit easy to use for nontechnical newcomers. The 1,152-by-864–resolution images were excellent. The Olympus D-500L looks and feels like a traditional 35-mm SLR camera (a trend we expect will continue) and is the only camera under $1,000 that offers true through-the-lens viewing. Its 1,024-by-768 resolution delivered near-flawless images both indoors and out.

We found ten other business-oriented cameras that merit serious attention before you make a final buying decision. Although they don't quite deliver the image quality of our winners, these cameras offer good combinations of performance and features that may suit your needs just as well: the Canon PowerShot 600 ($700 street), Epson PhotoPC 600 ($800 street), Fuji DX-7 ($499 list), Minolta Dimage V ($500 street), Olympus D-220L ($500 street), Olympus D-320L ($700 street), Ricoh RDC-300 ($499 list), Ricoh RDC-2E ($599 list), Sony DSC-F1 ($500 street), and Sony Mavica-MD7 ($799 list).

Finally, for semiprofessional photographers, the Agfa ePhoto 1280 ($899 list) is the only sub-$1,000 camera that has the right combination of image quality and user control to merit our Editors' Choice. It is a virtually goof-proof point-and-shoot camera, and unlike others in this category, the ePhoto 1280 offers the advanced user complete control over f-stop, shutter speed, and other settings. It also sports an excellent 3X zoom lens and can accept auxiliary lenses and filters. As you would expect, the unit's 1,280-by-960 image quality is outstanding.

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The downside is that at $25 to $50 per megabyte, memory cards are still relatively expensive. But the prices have dropped significantly over the last year, and they're expected to plummet further as higher-density cards reach the market. In the meantime, Sony has avoided the problem altogether with its Sony Mavica-FD5 ($599) and Mavica-FD7 ($799). These clever units save their 640-by-480 images to standard 3.5-inch floppy disks, making image capture inexpensive and image transfer a snap.

CMOS VS. CCD

Until this year, all of the digital cameras on the market used sensors called CCDs (charge-coupled devices) for image capture. This year, however, three of the roundup's units—the Sound Vision SV mini-209, UMAX MDX 8000, and Vivitar ViviCam 3000—use the new CMOS (complementary metal-oxide semiconductor) sensors. CMOS chips are substantially less expensive and problematic to fabricate, and they have significantly lower power requirements than CCDs. Also, CCDs have the single function of registering where light falls on each of the hundreds of thousands of sampling points. CMOS can be loaded with a host of other tasks, such as analog-to-digital conversion, load signal processing, handling white balance and camera controls, and more. It's also possible to increase CMOS density and bit depth without bumping up the cost.

For these and other reasons, most industry analysts believe that eventually, almost all entry-level digital cameras will be CMOS-based and that only midrange and high-end units will use CCDs. But our tests revealed a host of problems— such as noisy images and an inability to capture motion correctly—that indicate that CMOS has a way to go before reaching parity with CCD technology.

BEYOND IMAGE CAPTURE

Many manufacturers are also giving their digital cameras functionality that goes beyond basic picture taking. For instance, the Canon PowerShot 600, Nikon Coolpix 300, Ricoh RDC-2E, Sound Vision SV mini-209, UMAX MDX 8000, and Vivitar ViviCam 3000 come with built-in microphones for sound annotation. Also, 19 of the cameras we tested now include a video-out port, for displaying images on any television set.

Taking a step beyond video-out, the Ricoh RDC-2E, Sound Vision SV mini-209, UMAX MDX 800, and Vivitar ViviCam 3000 can double as videoconferencing cameras, although the low refresh rates (one frame every few seconds) do not let them capture or display motion in real time.

An increasing number of digital cameras have the ability to cut out the computer and output images directly to a printer. But without established interface standards, each camera requires a dedicated printer from its own manufacturer: Olympus cameras work only with Olympus printers, Casios with Casio printers, and so on. Casio, Olympus, Ricoh, and Sony printers are snapshot-size thermal-dye transfer devices; Fuji and Panasonic printers use Fuji's Thermo-Autochrome process, and the Epson Stylus Photo is a color ink jet.

THE SHOOTING EXPERIENCE

It's important to note that shooting with a digital camera isn't always like shooting with a film camera. Most units exhibit a 1- to 2-second lag time from when you press the shutter button to when the camera captures the image. Getting used to this problem can take some time, and it makes some cameras ill suited to taking action shots or working with squirmy children. In this roundup, only the Casio, Ricoh, and Sharp cameras had almost no delay. Also, most of the cameras in the roundup's price range require recovery time between shots for postcapture processing (converting the data from analog to digital, mapping, sharpening and compressing the image, and saving the image as a file). This interval can take from a few seconds to half a minute, depending on the camera and the condition of the batteries.

That brings us to the next problem: battery life. Look for a camera that includes rechargeable nickel cadmium or nickel hydride batteries, and plan to invest in a spare set to keep charged. Though many of the cameras will take regular alkaline batteries in a pinch, we found that such batteries typically last for only 20 minutes or so if you use the LCD. The rechargeables are good for 45 minutes to 2 hours of shooting, depending on which camera you're using and how much you use the LCD and flash.

With so much variety among digital cameras, the user can make choices based on need, budget, interest, and purpose. The following reviews discuss not only the strengths and weaknesses of each camera, but also the users who would most likely enjoy or benefit from using them. Of course, the fact that a camera would be a great business tool doesn't mean that your son or daughter won't be delighted when you bring it home from the office.

Agfa ePhoto 1280

The well-designed and easy-to-use Agfa ePhoto 1280 ($899 list) is one of the higher-end cameras in this roundup. One of our Editors' Choices, it offers the image quality and user control required by semiprofessional photographers and should suit demanding business users just as well.

A palm-size unit with a great lens, the ePhoto 1280 combines a high-resolution LCD viewfinder (2 inches diagonally) with several fully automatic and manual modes. Its swivel-mounted auto-focus 3X

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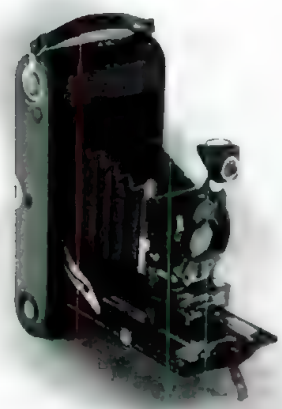

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zoom lens can be rotated 280 degrees, and its built-in flash is permanently affixed to the right of the lens, providing perfect illumination, no matter the angle.

The ePhoto 1280 accepts SmartMedia PC Cards to store images, and the camera's EasyPilot button lets you scroll through stored images or settings menus easily. In addition to a video-out port, there is a serial port that lets you both download and upload digital images, so you can use the camera as a presentation device.

Although the ePhoto 1280 is a virtually goof-proof point-and-shoot camera, one drawback is the relatively long recovery time needed between shots (17 seconds in our testing), which hinders the camera's use for quick or action shots. There is also a delay of about 1.5 to 3 seconds between when the shutter button is pressed and when the image is actually captured.

The ePhoto 1280 captures images at 1,280-by-960 resolution in 30-bit color, then samples the best data and saves the images as 24-bit color JPEGs. Our test shots were sharp, well focused, and crisp, with excellent detail in the highlights and shadows. Colors were generally good; the ePhoto 1280 earned a good score on our Color Accuracy test.

Agfa's latest effort is a well-designed and well-constructed business or hobbyist tool that combines point-and-shoot simplicity with excellent user controls and good image quality.—*Daniel Grotta and Sally Wiener Grotta*

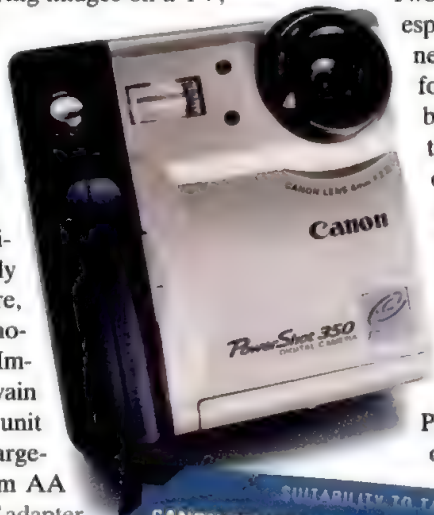
Agfa ePhoto 1280. List price: $899. Agfa Division, Bayer Corp., Wilmington, MA; 800-227-2780, 978-658-5600; www.agfahome.com/ephoto. *Choose 520 at www.pcmag.com/infolink.*

Canon PowerShot 350, Konica Q-mini; Canon PowerShot 600

PC MAGAZINE EDITORS' CHOICE

Intended for different market segments, these three cameras from Canon and Konica are all solid offerings. The Canon PowerShot 350 and the Konica Q-mini (each $500 street) are nearly identical units targeted primarily for families and light-duty business use. Each combines the features, ease of use, and image quality to merit our Editors' Choice. The Canon PowerShot 600 ($700 street) is a unit tailored for work that requires high-capacity storage and monochrome text capture capabilities. It is a solid business tool, but others in this roundup have surpassed this previous Editors' Choice honoree.

Except for insignificant variations in the outer shell, the Canon PowerShot 350 and the Konica Q-mini are essentially the same. Each is small, square, and compact; each unit features 640-by-480 resolution, a removable 2MB CompactFlash memory card, and a built-in flash with red-eye reduction. Each camera also has a video-out port for displaying images on a TV, plus a 1.8-inch color LCD that can be swiveled 40 degrees for angled viewing. Neither has an optical viewfinder.



Canon and Konica bundle virtually identical software, including Adobe PhotoDeluxe 1.0, PhotoImpact SE, and a Twain driver. Each unit includes three rechargeable nickel cadmium AA batteries and an A/C adapter. Since the LCDs are a heavy drain, you will have to replace the batteries fairly often during normal use.

During testing, both cameras generated high-quality outdoor shots. Focus and depth of field were excellent, although detail was somewhat limited by the 640-by-480 resolution. All images exhibited crisp, saturated, and very accurate color, as well as correct contrast and brightness. In fact, these cameras were two out of only eight in this roundup to achieve an excellent score on our Color Accuracy test. Our mixed-lighting office shots (using fluorescent, incandescent, and flash) gave the cameras some difficulty, however. After we manually set the white balance, we were still unable to get clean colors or pure whites, and a slight yellow tinge muted the images. In general, though, these are exemplary cameras in terms of resolution and price.

The higher-end Canon PowerShot 600, our Editors' Choice in last year's roundup, has since been eclipsed by newer units with higher maximum resolutions. The PowerShot 600 remains a popular model for business users, though, because of its rich and still unique set of features.

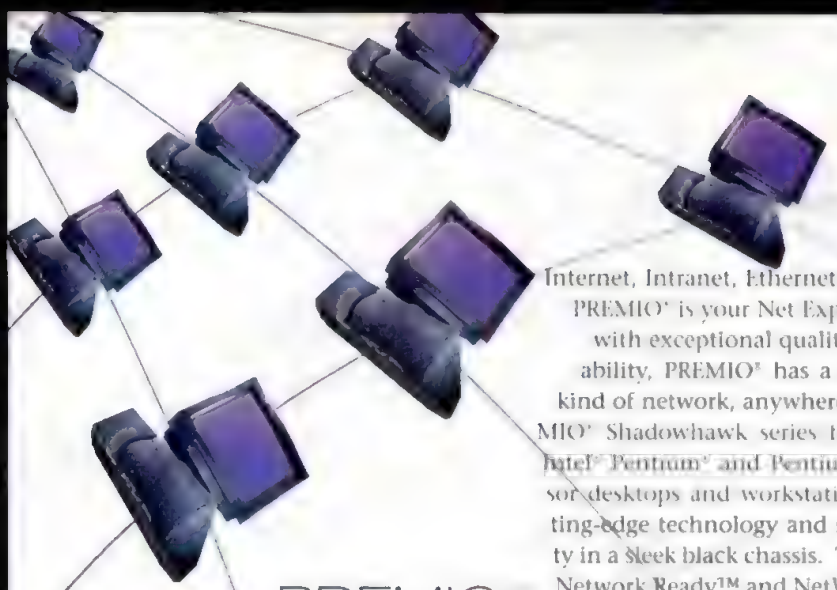
Thanks to its three different resolution options and three different compression modes, you can select from nine quality settings when framing shots. In addition, the PowerShot 600 numbers images incrementally for easy identification and storage. Two features that make it an especially formidable business tool are its text-mode format and storage capability. Text mode switches the camera from 24-bit color to 8-bit gray-scale, making it essentially a portable scanner. You can photograph a document, run it through OCR software, and transform the image into a text file. Also, the PowerShot 600 is still the only entry-level digital camera that can save to Type I, II or III PC Card memory cards or hard disks. Depending on the disk you buy, you can record up to 3,000 images (highest resolution/lowest compression) without reloading.

SUITABILITY TO TASK

CANON POWERSHOT 350	
Family	Excellent
Business	Fair
Semiprofessional	Poor
KONICA Q-MINI	
Family	Excellent
Business	Fair
Semiprofessional	Poor
CANON POWERSHOT 600	
Family	Poor
Business	Good
Semiprofessional	Good

The PowerShot 600 is as easy to operate as a 35mm rangefinder camera, except for the 3-second delay after the shutter button is pressed and when the image is actually captured. But its most serious deficiency is its lack of an LCD viewfinder. The optical viewfinder displays only about 85 percent of the image area that is actually covered, and the frosted frame marks are visually confusing when trying to calculate parallax for close-ups. There's no sure way to know what you're capturing until you actually see the image.

On our tests, the PowerShot 600 per-



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the most demanding group.

The DC120 is a successor to the slightly larger Kodak DC40 and Kodak DC50 (a past Editors' Choice winner), and it maintains the boxy, somewhat clunky shape. It comes with 2MB of built-in memory and can hold removable CompactFlash memory cards. It offers fully automatic or limited manual control (you can select shutter speed or f-stop, but not both, because each determines the other). If you add Kodak's optional adapter ($20 list), you can sync the DC120 with studio strobes. This feature is especially useful for tabletop photography or corporate ID shots. Although the unit's built-in flash does not offer red-eye reduction, it can illuminate up to 16 feet—a much greater area than with most other entry-level digital cameras we tested.

Operating the DC120 is relatively simple—if not always convenient. The power-zoom and shutter buttons are easy to use, although Kodak has redesigned them to make one-handed shooting difficult if not impossible. Although this design reduces camera shake, it also hinders taking quick shots and candids. The optical viewfinder is bright, and it displays more than 90 percent of the captured image area. The 2-inch LCD viewfinder drains power and lacks shielding from sunlight (despite a hinged shield and manual brightness adjustment), so it is best used for macro shots only.

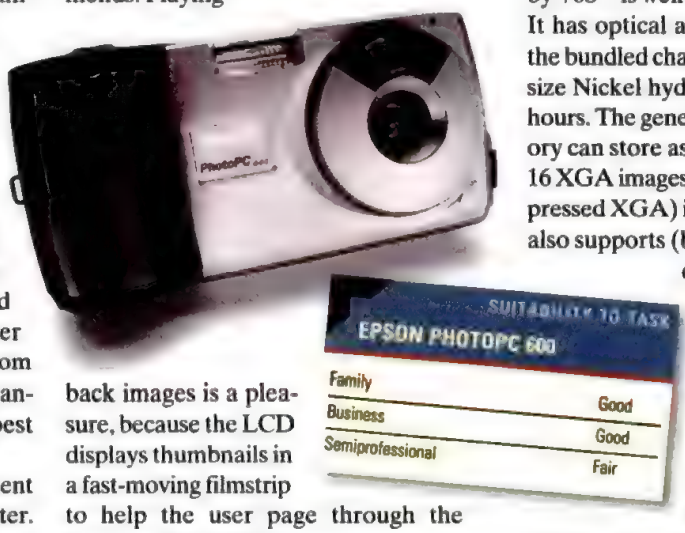
Where the camera can be inconvenient is in downloading images to the computer. That's because the DC120 saves images only in Kodak's proprietary .KDC format, not in JPEG or the new FlashPix format. Since most image-editing programs cannot directly open .KDC files, users must either import images via Kodak's Twain driver or install the bundled program PhotoEnhancer on the computer.

The DC120's test shots, which had a laudable 1,280-by-960 resolution, were among the best of any camera in this roundup. They were sharp, bright, clean, and evenly illuminated, exhibiting good detail even in the shadows. Skin tones and other colors were close to bang-on accurate. Indeed, the DC120 was one of the best units on our Color Accuracy test.

For similar image quality but an easier operating experience, take a look at the DC210. With its metal body and traditional-looking array of lens, viewfinder, and flash, the DC210 looks, feels, and handles much like a precision point-and-shoot 35-mm film camera. It can port images in either JPEG or FlashPix format to removable CompactFlash memory cards.

The DC210 has both optical and LCD viewfinders, red-eye reduction on the built-in flash, video-out capability, and an IrDA interface. Although it provides no manual control over f-stops or shutter speeds, you can select the resolution (1,152-by-864 or 640-by-480) as well as the compression level (good, better, or best).

The DC210 is almost as easy to operate as a simple point-and-shoot camera. Even without reading Kodak's excellent documentation, we had little difficulty navigating the control panel's plain-English menus. Playing back images is a pleasure, because the LCD displays thumbnails in a fast-moving filmstrip to help the user page through the images more quickly.



On our tests, the DC210's image quality was similar to the DC120's. Contrast and illumination were close to perfect, though there was some clipping (loss of light) in the highlights. Images were sharp and detailed, and colors were very good; like the DC120, the unit had an excellent score on our Color Accuracy test.

Despite a few inconveniences, the DC120 is an excellent choice for users who want top-of-the-line image quality for business uses such as real estate and Web images. It can even satisfy the demands of photo hobbyists and semiprofessionals. Our recommendation, though, is to spend the extra money for the DC210. Kodak has a winner here for business users who want simplicity, style, and superior-looking pictures.—*DG and SWG*

Eastman Kodak DS DC120 Zoom Camera. List price: $799. **Eastman Kodak DS DC210 Zoom Camera.** List price: $899. Eastman Kodak Co., Rochester, NY; 888-375-6325; www.kodak.com. *Choose 523 at www.pcmag.com/infolink.*

Epson PhotoPC 600

With its appealing mix of image quality and features, the Epson PhotoPC 600 ($800 street) is a good choice for business users and hobbyists who want an easy-to-use but robust tool. Though you can get better image quality from one of the other megapixel cameras here (such as the Eastman Kodak DS DC120 Zoom Camera), business users and Web designers should take a close look.

The PhotoPC 600's resolution—1,024-by-768—is well above any VGA camera's. It has optical and LCD viewfinders, and the bundled charger can replenish the AA-size Nickel hydride batteries in about 2.5 hours. The generous 4MB of built-in memory can store as many as 50 VGA images, 16 XGA images, and 7 superfine (less compressed XGA) images all at once. The unit also supports (but does not include) standard CompactFlash PC Card memory cards. Other features include 3X digital zoom, three-mode flash, and a video-out port.

A special multiple-image mode lets you take nine thumbnail shots in one frame automatically in a customizable time span (0.5 to 3 seconds), to obtain a stop-action view of a quick motion (such as a golf swing). The camera can also give a panoramic effect by chopping off the top and bottom of a 1,024-by-384 image. (The angle of the shot isn't greater than with normal shooting.) In addition to using standard 24-bit color, the PhotoPC 600 can capture images in 8-bit gray-scale mode. Controls and menus are well placed and easy to follow, and there's little need to consult the well-illustrated manual. Note that when capturing images, the PhotoPC 600 takes a long 30 seconds to process each photo in highest-quality mode, and that can slow you down.

The camera can print directly to an Epson Stylus Color printer, via a $99 kit that includes an AC adapter for the cam-

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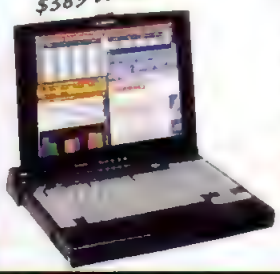

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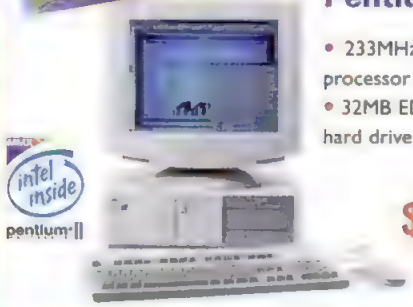

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PERFORMANCE TESTS

IMAGE QUALITY TESTS: DIGITAL CAMERAS

Image quality varied widely among the 29 sub-$1,000 cameras we tested. Resolution was a factor, but a unit's ability to capture color and light accurately was also significant. Almost all of the units should prove fine for personal use. If you need high-quality images for business use, your choices are more limited.

Qualitative Tests: Comparing Image Quality

For our indoor test photo, we set each camera for optimum image quality (highest-quality mode, flash where offered) and carefully examined each image on a monitor for caliber as well as for specific details and quality indicators. Our model's curly hair should display detail in both highlights and shadows, so that it looks natural and as lively as it is in real life. The sweater's individual stitches should be clear, rather than a smear of color. Also, the sweater has very vibrant colors that would be dulled by any color shift or lack of saturation in the camera's capture.

On the *PC Magazine* covers, we didn't expect the small print to be legible, because of the resolution limits of these cameras, but the large print should be clean and readable. The framed portrait of the child should not only be recognizable but should also have realistic colors. The edges of the white writing pad, the desk, and other naturally straight lines should be clean and nonjaggy. (We looked most closely at the diagonal lines, which are always more difficult than perfectly horizontal or vertical edges.)

If the camera has a flash, it should cover the entire desk without blowing out any highlights. If it doesn't have a flash, we used any white balance and exposure compensation features available to try to get a well-exposed picture. Given the mixed lighting conditions, good exposure was an important dividing line among these cameras.

In PhotoShop, we examined the images' histograms to see how the cameras handle highlights, shadows, and midtones. Any clipping (lack of data) in the highlights or shadows was an indication of a limited dynamic range. And of course we looked for natural, appealing skin tones.

Quantitative Tests: How We Tested

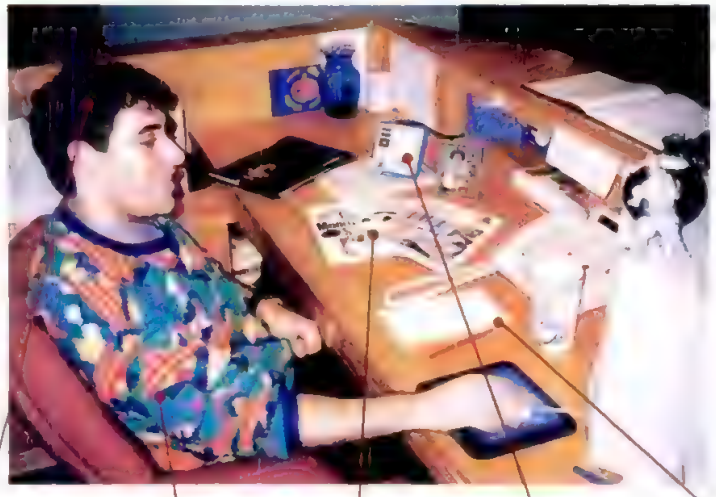
For the Color Accuracy test, we used each camera to photograph a Macbeth ColorChecker color rendition chart, a standard color test target in the graphic arts industry. We illuminated the chart with studio lights to simulate daylight, balancing them with colored gels and voltage stabilizers to keep the color temperature (light quality) relatively constant, between 6,050 and 6,200 degrees Kelvin.

We used Light Source's Colortron, an $1,100 Windows-based spectrophotometer that reads color values on almost anything, to determine the actual red, green, and blue (RGB) values of all the color squares in the specific Macbeth chart we were using. We then compared these known values with those captured by each camera by opening the test images in PhotoShop 4.0 and using a rectangular selection on each color square and the histogram dialog to determine the mean values of red, green, and blue. We calculated each image's variance for the most important colors: dark skin tone, light skin tone, cyan, magenta, yellow, black, white, and a neutral tone.

—Analysis written by DG and SWG

What to Look for in the Images

Making the comparison: This image was taken with a 35-mm film camera.



Better cameras will let you see the texture of our model's hair. Skin tones should be natural-looking.

Colors in a highly textured article (such as this sweater) should be cleanly delineated, not blurred.

The large print on these magazine covers should be legible.

Better cameras will capture details of items on the desk, such as the photo and the date on the calendar.

The edges of this pad, the desk, and other items should not be jagged.

Agfa ePhoto 1280 (1,280 x 960)

Canon PowerShot 350 (640 x 480)

Canon PowerShot 600 (832 x 608)

PERFORMANCE TESTS

COLOR ACCURACY

Lower numbers indicate more accurate color reproduction.

0–12: Excellent
13–15: Good
16–25: Fair
26 and above: Poor

	Agfa ePhoto 1280	Canon PowerShot 350	Canon PowerShot 600	Casio QV-200	Casio QV-700	Eastman Kodak DC120	Eastman Kodak DC210	Epson PhotoPC 600	Fuji DX-7	HP PhotoSmart	Konica Q-mini	Minolta Dimage V	Nikon Coolpix 300	Olympus D-220L	Olympus D-320L	Olympus D-500L	Panasonic PalmCam	Panasonic CoolShot	Ricoh RDC-2E	Ricoh RDC-300	Sharp VE-LC10	Sony DSC-F1
DARK SKIN TONES																						
LIGHT SKIN TONES	18	5	16	27	32	14	16	19	20	13	5	15	14	16	21	8	6	18	14	16	16	17
CYAN																						
MAGENTA	17	12	16	21	31	8	7	25	12	16	7	25	23	9	19	11	15	22	24	18	18	16
YELLOW																						
BLACK	16	16	11	16	17	16	14	17	17	14	18	16	0	17	16	11	16	15	8	16	16	10
WHITE											12											
NEUTRAL	8	8	8	36	22	10	10	6	17	10	6	13	5	12	10	4	7	6	10	10	10	6
AVERAGE																						

Casio QV-200 (640 x 480)

Casio QV-700 (640 x 480)

Eastman Kodak DC120 (1,280 x 960)

Eastman Kodak DC210 (1,152 x 864)

Epson PhotoPC 600 (1,024 x 768)

Fuji DX-7 (640 x 480)

HP PhotoSmart (640 x 480)

Konica Q-mini (640 x 480)

Minolta Dimage V (640 x 480)

Nikon Coolpix 300 (640 x 480)

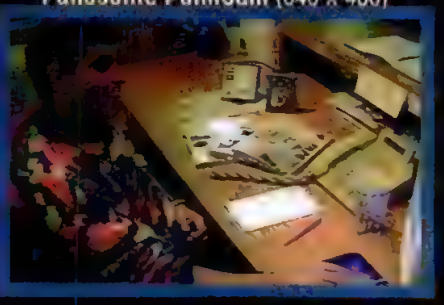
Olympus D-220L (640 x 480)

Olympus D-320L (1,024 x 768)

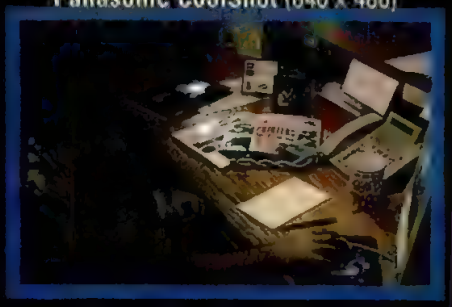
Sony Mavica FD-5	Sony Mavica FD-7	Sound Vision SV mini-209	Toshiba PDR-2	UMAX MDX 8000	Vivitar ViviCam 3000	Yashica KC 600
19	19	17	29	22	19	15
19	19	19	33	30	22	18
12	12	24	22	31	32	16
21	21	25	29	18	21	19
22	22	24	30	27	29	23
15	15	19	8	19	7	19
15	15	14	25	12	17	12

Olympus D-500L (1,024 x 768)

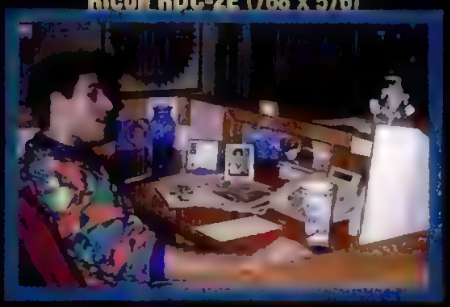
Panasonic PalmCam (640 x 480)



Panasonic CoolShot (640 x 480)



Ricoh RDC-2E (768 x 576)



Ricoh RDC-300 (640 x 480)

Sharp VE-LC1U (640 x 480)

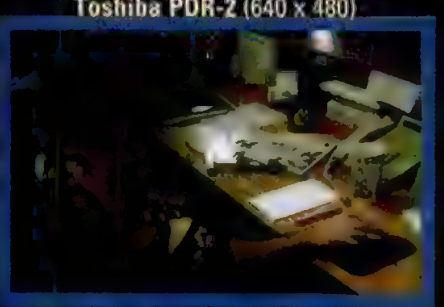
Sony DSC-F1 (640 x 480)

Sony Mavica-FD5 (640 x 480)

Sony Mavica-FD7 (640 x 480)

Sound Vision SV mini-209 (1,000 x 800)

Toshiba PDR-2 (640 x 480)



UMAX MDX 8000 (1,000 x 800)

Vivitar ViviCam 3000 (1,000 x 800)

Yashica KC 600 (640 x 480)

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MMX intel inside pentium II processor

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- 128-bit Graphics Accelerator with 65K Colors at 1024x768
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HP PhotoSmart fine if you're looking for a tool for extended computer fun, but business users will need to spend more to get better image quality.—*BB*

HP PhotoSmart. Street price: $300. Hewlett-Packard Co., San Diego, CA; 888-474-3867; www.hp.com/go/photosmart. *Choose 526 at www.pcmag.com/infolink.*

Minolta Dimage V

Targeted at amateur photo hobbyists, home PC enthusiasts, and business users, the Minolta Dimage V ($500 street) is one of the better VGA cameras in this roundup. Its good image quality (given the 640-by-480 resolution) and unique detachable lens set it apart, though it lacks some checklist features that we've come to expect from today's digital cameras.

A handsome device, the Dimage V is small and compact enough to slip into a shirt pocket. Buttons and controls are intuitive, well placed, marked in English, and recessed so you won't activate them accidentally. The lens is side-mounted and can be swiveled 180 degrees. On the side of the lens is a lever that controls the 2.7X fixed-focus zoom manually. Most unique is the detachable lens assembly, which can be slipped off its mount and attached to the camera with a 40-inch cord. The user can then position the lens above a crowd, up close to a surgeon's scalpel, or through a peephole in a wall. Curiously, the flash is built into the body rather than the lens mount, which poses a potential lighting problem when the lens is detached.

Taking standard pictures with the Dimage V is easy. But unfortunately, the camera has no optical viewfinder; you must frame the subject through a grainy, jerky, 1.8-inch color LCD on the back.

On our tests, the images the Dimage V produced were among the best of any VGA-resolution camera. They were sharp, properly exposed, with good contrast and excellent depth of field. Colors were accurate and nicely saturated, with very appealing skin tones. Although there was some clipping in the highlights, the Dimage V had no difficulty capturing good detail in the shadows and midtones. The unit had a good score on our Color Accuracy test.

The images should please hobbyists and PC enthusiasts; they could also serve for light-duty business applications. Unless you need the higher resolution of a more expensive camera, the Minolta Dimage V is a reasonable choice.—*DG and SWG*

Minolta Dimage V. Street price: $500. Minolta Corp., Ramsey, NJ; 201-825-4000; www.minoltausa.com. *Choose 528 at www.pcmag.com/infolink.*

SUITABILITY TO TASK

MINOLTA DIMAGE V	
Family	Good
Business	Good
Semiprofessional	Poor

Nikon Coolpix 300

Designed specifically for business users, the Nikon Coolpix 300 has a number of unusual features that give it a higher-than-average list price of $699 (less a $150 manufacturer's rebate). Unfortunately, the extra features don't compensate for shortcomings in image quality, which will limit its appeal in the broader market.

The business-oriented features consist of enhancements to the LCD display panel, which complements the optical viewfinder. The panel is touch-sensitive, and you can use the slide-in stylus, located next to the AC adapter plug, to write on top of photo images in red, black, or green. The camera can also record sounds, so you can take verbal notes when you snap a picture. While these are handy features, they are of limited use since both are of low quality: The 8-kHz monaural sound is scratchy, and the handwritten annotations are coarse and of low-resolution.

The Coolpix lacks any removable storage media, so you have to use a direct connection to transfer images to your computer once the built-in 4MB of storage fills up. Support for a serial connection is standard, but transfers were slow, taking about 38 seconds per image in our Labs. There is a SCSI port, and Nikon sells an optional connector kit that consists of a cable, an Adaptec 2902 PCI card, and an AC adapter—all for $150 (list). This kit speeds up transfers to about half a second per image—a big improvement.

Taking pictures with the Coolpix is simple. The Twain-compatible driver makes it easy to transfer images directly into your application, as well as to work with sound and handwritten annotation data. On the other hand, you can configure the camera only by using the LCD touch screen, and the nested menus are awkward to navigate quickly.

SUITABILITY TO TASK

NIKON COOLPIX 300	
Family	Fair
Business	Fair
Semiprofessional	Poor

The Coolpix scored well on our Color Accuracy test, but on other tests it did not fare as well. Images generally looked flat, with a low dynamic range that lost subtle details. The histogram showed pronounced clipping at both the low and high ends of the spectrum.

Unremarkable image quality, an awkward user interface, slow transfers without the optional SCSI connection, and the lack of removable media detract from the Coolpix 300's appeal. This product will be of interest primarily to those business users who find that the voice and handwriting annotation features outweigh the other shortcomings.—*AP*

Nikon Coolpix 300. List price: $699 (less $150 rebate). Nikon Inc., Melville, NY; 800-526-4566; www.nikonusa.com. *Choose 529 at www.pcmag.com/infolink.*

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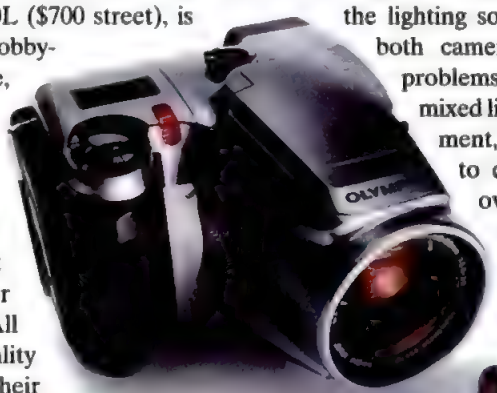
Olympus D-220L, D-320L, D-500L

PC MAGAZINE EDITORS' CHOICE

Olympus manufactures two very different lines of digital cameras for the general consumer market. The entry-level line, represented here by the Olympus D-220L ($500 street) and D-320L ($700 street), is for business users and hobbyists. The higher-end line, which comprises the D-500L ($900 street) and D-600L (at $1,300 street, above our price cutoff for this story), is targeted at more demanding power users and journalists. All deliver fine image quality and feature sets for their intended audiences.



The D-220L and D-320L look and feel like traditional point-and-shoot cameras. They sport both optical and LCD viewfinders and can accommodate removable SmartMedia PC Card memory cards. Both the D-220L and the D-320L have an auto-focus, fixed-focal-length glass lens equivalent in range to a 36-mm wide-angle lens on a 35-mm camera.

SUITABILITY TO TASK	
OLYMPUS D-220L	
Family	Good
Business	Good
Semiprofessional	Poor
OLYMPUS D-320L	
Family	Good
Business	Excellent
Semiprofessional	Fair
OLYMPUS D-500L	
Family	Good
Business	Excellent
Semiprofessional	Good

Taking pictures with either camera is a simple matter of pointing, pressing the shutter down halfway to engage the auto-focus, and shooting. The 1-second delay between pressing the shutter and capturing the subject can be disconcerting, however. Although the documentation promises that the recycle time is a relatively speedy 8 seconds, our tests showed that it averaged 7.5 seconds for the D-220L and a poky 12 to 17 seconds with the D-320L. Checking camera status and changing settings can be difficult—partly because the buttons and control panel commands are not well marked or intuitive, and partly because of the poor quality of the postcard-size, multilingual documentation.

The D-220L delivers 640-by-480 resolution images suitable for hobbyists and less-demanding business users. The 1,024-by-768 resolution of the D-320L makes it better suited to day-to-day business uses and Web images. During testing, we saw excellent detail in the shadows and highlights in images from both cameras, though reduced contrast and slight overexposure flattened the lighting somewhat. Also, both cameras had slight problems shooting in a mixed lighting environment, which tended to create a ruddy overcast to the colors.

Like its siblings, the higher-end D-500L looks, feels, and operates very much like a 35-mm single-lens reflex camera. It is relatively light and well balanced, with instant access to all controls, the battery compartment, and the removable media.

The camera's most prominent feature is a protruding lens snout that houses a 3X auto-focus power zoom lens. In case that's not enough range for you, the bezel is threaded for attaching auxiliary lenses and filters. Unlike most entry-level digital cameras with strobe lights positioned to the side or slightly above the lens, the D-500L's pop-up strobe puts the flash tube a few inches above the lens for better, more even, and more penetrating illumination. Unlike most other digital cameras, too, the D-500L has true through-the-lens viewing in addition to an LCD color viewfinder.

We found the D-500L an easy and responsive camera to use. Image processing was relatively fast (6.5 to 7.5 seconds) among the cameras we tested.

Image quality is excellent. Our test shots were sharp and detailed, with good depth of field. Brightness and contrast were very even, and because the camera handles mixed lighting well, colors were rich, saturated, and accurate. The D-500L was one of the top performers on our Color Accuracy test.

Olympus also markets a snapshot-size thermal dye printer ($400 street) that interfaces directly with all of the company's digital cameras. Unfortunately, a unit was not available in time for testing.

In sum, the Olympus entries are among the best available. The D-220L and D-320L are both fine choices, combining most of the features that users will want and need at very competitive prices. And image quality from the D-320L and D-500L, in particular, should attract serious business users and even some semiprofessional photographers.—*DG and SWG*

Olympus D-220L. Street price: $500. **Olympus D-320L.** Street price: $700. **Olympus D-500L.** Street price: $900. Olympus America Inc., Melville, NY; 800-622-6372, 516-844-5000; www.olympus.com. *Choose 530 at www.pcmag.com/infolink.*

SUITABILITY TO TASK	
PANASONIC PALMCAM DC1000	
Family	Fair
Business	Good
Semiprofessional	Poor
PANASONIC COOLSHOT KXL-601A	
Family	Fair
Business	Fair
Semiprofessional	Poor

Panasonic PalmCam PV-DC1000, CoolShot KXL-601A

Targeted for business users and general consumers, the Panasonic PalmCam PV-DC1000 ($380 street) and the Panasonic CoolShot KXL-601A ($600 street) are slim, compact digital cameras from different divisions of Panasonic. Although both units are rich in features and affordable, the fact that neither has a flash limits them to outdoor use by the occasional business user or the novice

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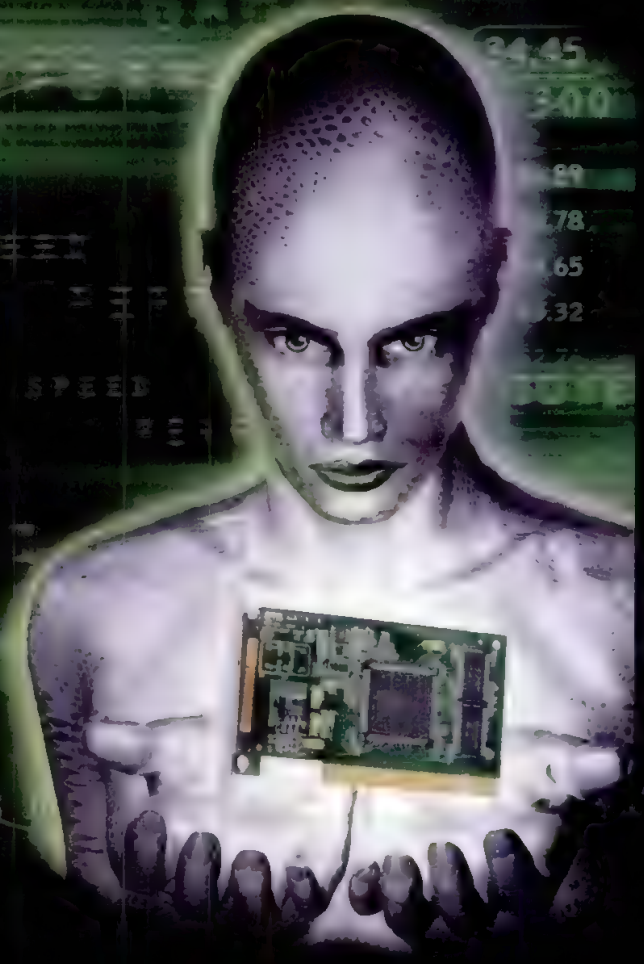

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SUMMARY OF FEATURES

Digital Cameras

■ YES ☆ NO Products listed in review order	Agfa ePhoto 1280	Canon PowerShot 350, Konica Q-mini	Canon PowerShot 600	Casio QV-200	Casio QV-700	Eastman Kodak DS DC120 Zoom Camera	Eastman Kodak DS DC210 Zoom Camera	Epson PhotoPC 600
Price	$899 list	$500 street	$700 street	$500 street	$600 street	$799 list	$899 list	$800 street
Native resolution	1,280 x 960	640 x 480	832 x 608	640 x 480	640 x 480	1,280 x 960	1,152 x 864	1,024 x 768
Sensor size and type	0.33-inch CCD	0.33-inch CCD	0.33-inch CCD	0.25-inch CCD	0.25-inch CCD	0.5-inch CCD	0.33-inch CCD	0.33-inch CCD
Total number of pixels	810,000	350,000	570,000	360,000	350,000	816,000	1 million	810,000
Color depth	30-bit	24-bit	24-bit	24-bit	24-bit	24-bit	24-bit	24-bit
Monochrome mode	☆	☆	■	☆	■	☆	☆	■
Internal memory	None	None	1MB	4MB	None	2MB	None	4MB
Removable memory type	SSFDC flash	CompactFlash	PC Card Type I, II, III	PC Card flash	PC Card flash	CompactFlash	CompactFlash	CompactFlash
Image capacity in economy/fine mode	60 / 6	47 / 11	18 / 4	192 / 64	47 / 14	20 / 7	60 / 16	50 / 7
Native file format	JPEG	JPEG	JPEG	CAM	CAM	KDC	JPEG or FlashPix	JPEG
ISO equivalency	100	120	100	100	150	160	140	100
Glass or plastic lens	Glass	Glass (Canon), plastic (Konica)	Glass	Glass	Glass	Glass	Glass	Glass
Equivalent 35-mm camera lens	38–114 mm	43 mm	50 mm	38 mm	38 mm	38–114 mm	29–58 mm	36 mm
Auto-focus/Fixed focus	■ ☆	☆ ■	■ ☆	☆ ■	☆ ■	■ ☆	☆ ■	■ ☆
Zoom range/Close-up distance (macro mode)	3X / 4 inches	N/A / 1 inch	N/A / 4 inches	N/A / 5 inches	N/A / 5 inches	3X / 8 inches	2X / 8 inches	3X / 2 inches
Type of viewfinder	LCD	LCD	Optical	LCD	LCD	Optical and LCD	Optical and LCD	Optical and LCD
Size of LCD (diagonal)	2 inches	1.8 inches	N/A	1.8 inches	2.5 inches	1.6 inches	1.8 inches	2 inches
Selective image deletion	■	■	■	■	■	■	■	■
Selective image protection	■	☆ (Canon) ■ (Konica)	☆	■	■	☆	☆	■
Flash modes	On, off, auto, red-eye reduction	On, off, auto, red-eye reduction	On, off, auto	None	On, off, auto	On, off, auto	On, off, auto, red-eye reduction	On, off, auto
Effective range	Up to 10 feet	2–10 feet	4 inches–20 feet	N/A	2–10 feet	2–16 feet	Up to 12 feet	8 inches–8 feet
Syncs to external strobes	☆	☆	☆	☆	☆	■	☆	☆
Serial-port speed (Kbps)	115	115	N/A	115	115	230	115	115
NTSC video out/S-Video out	■ ☆	■ ☆	☆ ☆	■ ☆	■ ■	☆ ☆	■ ☆	■ ☆
Digital in	■	☆	☆	■	■	☆	☆	☆
IrDA/SCSI/Direct printer port	☆ -	☆ ☆ ☆	☆ ☆ ☆	☆ ☆ ■	☆ ☆ ■	☆ ☆ ☆	■ ☆ ☆	☆ ☆ ■
Voice annotation/Burst mode	☆ ☆	☆ ☆	■ ☆	☆ ■	☆ ■	☆ ☆	☆ ☆	☆ ☆
Firmware upgradable	■	☆	■	☆	☆	■	■	■
Companion printer available	☆	☆	☆	■	■	☆	☆	■
User can print directly from camera	N/A	N/A	N/A	■	■	N/A	N/A	■
Printing technology and price	N/A	N/A	N/A	Thermal dye ($300)	Thermal dye ($300)	N/A	N/A	Ink jet ($500)
Warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Toll-free technical support	☆	■	■	■	■	■	■	■
Web address	*www.agfahome.com*	*www.powershot.com, www.konica.com*	*www.powershot.com*	*www.casio.com*	*www.casio.com*	*www.kodak.com*	*www.kodak.com*	*www.epson.com*

N/A—Not applicable: The product does not have this feature.

who is curious about digital cameras.

The CoolShot, from Panasonic Interactive Media, delivers 320-by-240 resolution in normal mode or 640-by-480 in high-resolution mode. The unit stores images on removable CompactFlash memory cards that snap into an included PC Card adapter for easy transfer to a PC. The slim camera (2.4 by 5.2 by 0.8 inches) weighs just 7.1 ounces with four AAA batteries. The snap-on LCD viewer assembly, which requires an additional four AAA batteries, adds another 1.5 ounces.

The LCD viewer folds up alongside the camera for easy transport and folds down and rotates for convenient viewing of its 1.8-inch screen. (The camera is also available for $400 without the LCD as the CoolShot KXL-600A.) The CoolShot bundle includes a video cable for displaying images on a TV or monitor and LivePix image-editing software.

Shooting pictures is easy and quick, with a recovery period of only about 1 second needed between shots. On our tests, we found that the CoolShot's VGA image quality was fine for outdoor shots, where there is sufficient natural light and fine detail is less important. It also posted an excellent score on our Color Accuracy test. On inside shots, however, the camera's lack of a flash caused a general darkening effect, making it hard to see small features and details. Images were generally underexposed and soft in focus.

The PalmCam PV-DC1000 (from Panasonic Consumer Electronics Co.) is a better bargain, and it's even more compact than the CoolShot. Measuring just 2.3 by 3.5 by 1.25 inches, it's the smallest camera we tested that had an LCD viewer (there is no optical viewfinder). With 2MB of nonremovable storage, the PalmCam is capable of storing 94 images in normal mode, 32 in fine mode, or 16 in

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Continues

	Fuji DX-7	HP PhotoSmart	Minolta Dimage V	Nikon Coolpix 300	Olympus D-220L	Olympus D-320L	Olympus D-500L	Panasonic PalmCam PV-DC1000	Panasonic CoolShot KXL-601A	Ricoh RDC-300
	$499 list	$300 street	$500 street	$699 list	$500 street	$700 street	$900 street	$380 street	$600 street	$499 list
	640 x 480	640 x 480	640 x 480	640 x 480	640 x 480	1,024 x 768	1,024 x 768	640 x 480	640 x 480	640 x 480
	0.33-inch CCD	0.33-inch CCD	0.33-inch CCD	0.33-inch CCD	0.33-inch CCD	0.33-inch CCD	0.5-inch CCD	0.25-inch CCD	0.25-inch CCD	0.25-inch CCD
	350,000	330,000	350,000	330,000	350,000	810,000	850,000	350,000	360,000	350,000
	24-bit	24-bit	24-bit	24-bit	24-bit	24-bit	24-bit	24-bit	24-bit	24-bit
	■	■	■	■	■	■	■	■	■	■
	16MB	None	None	4MB	None	None	None	2MB	8MB	4MB
	PC Card flash	PC Card flash (proprietary)	SSFDC flash	None	SSFDC flash	SSFDC flash	SSFDC flash	None	CompactFlash	None
	30 / 22	32 / 4	40 / 6	132 / 66	80 / 8	30 / 4	24 / 3	94 / 16	96 / 24	100 / 25
	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG
	150	180	100	100	130	100	180	Info not available	100	80
	Glass	Glass	Glass	Glass	Glass	Glass	Glass	Glass	Glass	Glass
	38 mm	43 mm	38–92 mm	45 mm	36 mm	36 mm	50–150 mm	55 mm	50 mm	38 mm
	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
	N/A / N/A	N/A / 2 inches	2.7X / 2 inches	N/A / 5 inches	N/A / 8 inches	N/A / 8 inches	3X / 12 inches	N/A / 2 inches	N/A / 5 inches	N/A / 1 inch
	Optical and LCD	Optical	LCD	Optical and LCD	Optical and LCD	Optical and LCD	Reflex and LCD	LCD	LCD	LCD
	1.8 inches	N/A	1.8 inches	2.5 inches	2 inches	2 inches	1.8 inches	1.8 inches	1.8 inches	1.8 inches
	■	■	■	■	■	■	■	■	■	■
	■	■	■	■	■	■	■	■	■	■
	Auto	On, off, auto	On, off, auto	On, off, auto, red-eye reduction	On, off, auto, fill, backlight, red-eye reduction	On, off, auto, fill, backlight, red-eye reduction	On, off, auto, fill, backlight, red-eye reduction	None	None	On, off, auto
	3–10 feet	10–20 feet	Up to 12 feet	3–8 feet	8 inches–12 feet	8 inches–10 feet	Up to 18 feet	N/A	N/A	2–10 feet
	■	■	■	■	■	■	■	■	■	■
	57	115	N/A	19	115	115	115	38	115	115
	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
	■	■	■	■	■	■	■	■	■	■
	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
	■	■	■	■	■	■	■	■	■	■
	■	■	■	■	■	■	■	■	■	■
	■	■	N/A	N/A	■	■	■	■	N/A	■
	Thermal dye ($500)	Ink jet ($500)	N/A	N/A	Thermal dye ($400)	Thermal dye ($400)	Thermal dye ($400)	Thermal dye ($600)	N/A	Thermal dye ($600)
	None	1 year	1 year	1 year	1 year	1 year	1 year	1 year	4 years	1 year
	■	■	■	■	■	■	■	■	■	■
	www.fujifilm.com	*www.hp.com/go/photosmart*	*www.minoltausa.com*	*www.nikonusa.com*	*www.olympus.com*	*www.olympus.com*	*www.olympus.com*	*www.panasonic.com/palmcam*	*www.panasonic.com*	*www.ricohcpg.com*

superfine mode, all in JPEG format. The complete bundle includes an AC adapter, two rechargeable nickel-cadmium AA batteries (it can also use alkaline cells), and a handy docking station that lets you connect the PalmCam to a PC via the included serial cable. Adobe PhotoDeluxe and EasyPhoto organizer and viewer software are welcome additions that augment the camera's value.

The 1.8-inch TFT LCD takes its toll on battery life, so you'll need to keep the charger or a pocket full of alkalines with you. The PalmCam has a simple interface, but recovery time is sluggish at about 20 seconds between shots.

Its lack of a flash and the 640-by-480 resolution suggest that you'll do better using it for quick and easy outside shots than for true family portraits or indoor image captures. Like the CoolShot, the PalmCam did well on our Color Accuracy test. Other scores were more problematic, however. In addition to being out of focus, the test images lacked contrast, and the skin tones were slightly posterized. Details were generally recognizable, with no great distortion, but blurry edges made it hard to pick out small features.

If you want to capture clear shots of detailed images or close-ups of people, especially taken inside, then neither Panasonic offering will fill the bill. But if you just need clerical photos for events or meetings, or for outside business work like insurance claims or real estate, then either one of these cameras is a good candidate.—*BB*

Panasonic PalmCam PV-DC1000. Street price: $380. Panasonic Consumer Electronics Computer Co., Secaucus, NJ; 800-211-7262. www.panasonic.com/palmcam. **Panasonic CoolShot KXL-601A.** Street price: $600. Panasonic Interactive Media, Santa Clara, CA; 408-653-1888. www.panasonic.com. *Choose 531 at www.pcmag.com/infolink.*

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SUMMARY OF FEATURES

Digital Cameras

■ YES ▥ NO

Products listed in review order	Ricoh RDC-2E	Sharp VE-LC1U	Sony DSC-F1	Sony Mavica-FD5	Sony Mavica-FD7	Sound Vision SV mini-209	Toshiba PDR-2
Price	$599 list	$500 street	$500 street	$599 list	$799 list	$479 list	$450 street
Native resolution	768 x 578	640 x 480	640 x 480	640 x 480	640 x 480	1,000 x 800	640 x 480
Sensor size and type	0.25-inch CCD	0.33-inch CCD	0.33-inch CCD	0.25-inch CCD	0.25-inch CCD	0.33-inch CMOS	0.25-inch CMOS
Total number of pixels	410,000	350,000	350,000	380,000	380,000	800,000	330,000
Color depth	24-bit	24-bit	24-bit	24-bit	24-bit	30-bit	24-bit
Monochrome mode	■	■	■	■	■	■	■
Internal memory	2MB	4MB	4MB	None	None	1MB	None
Removable memory type	None	None	None	Floppy disk	Floppy disk	PC Card flash	SSFDC flash
Image capacity in economy/fine mode	38 / 9	60 / 30	108 / 30	40 / 20	40 / 20	28 / 10	48 / 24
Native file format	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG	JPEG
ISO equivalency	100	100	Info not available	100	100	50	100
Glass or plastic lens	Glass	Glass	Glass	Glass	Glass	Glass	Glass
Equivalent 35-mm camera lens	35–55 mm	43 mm	35 mm	47 mm	40–400 mm	55 mm	49 mm
Auto-focus/Fixed focus	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Zoom range/Close-up distance (macro mode)	N/A / 1 inch	N/A / 2 inches	N/A / 2 inches	N/A / 5 inches	10X / 5 inches	N/A / N/A	N/A / N/A
Type of viewfinder	Optical and LCD	LCD	LCD	LCD	LCD	Optical	Optical
Size of LCD (diagonal)	1.8 inches	2.5 inches	1.8 inches	2.5 inches	2.5 inches	N/A	N/A
Selective image deletion	■	■	■	■	■	■	■
Selective image protection	■	■	■	■	■	■	■
Flash modes	On, off, auto	None	On, off	On, off	On, off	On, off, auto, fill	None
Effective range	Up to 25 feet	N/A	2–10 feet	10–25 feet	10–25 feet	3–10 feet	N/A
Syncs to external strobes	■	■	■	■	■	■	■
Serial-port speed (Kbps)	N/A	115	115	N/A	N/A	115	N/A
NTSC video out/S-Video out	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Digital in	■	■	■	■	■	■	■
IrDA/SCSI/Direct printer port	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Voice annotation/Burst mode	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Firmware upgradable	■	■	■	■	■	■	■
Companion printer available	■	■	■	■	■	■	■
User can print directly from camera	■	N/A	■	N/A	N/A	N/A	N/A
Printing technology and price	Thermal dye ($600)	N/A	Thermal dye ($500)	N/A	N/A	N/A	N/A
Warranty	1 year	1 year	1 year	90 days	90 days	1 year	1 year
Toll-free technical support	■	■	■	■	■	■	■
Web address	*www.ricohcpg.com*	*www.sharp-usa.com*	*www.sony.com/image*	*www.sony.com/image*	*www.sony.com/image*	*www.soundvisioninc.com*	*www.toshiba.com/taisisd/dsc*

N/A—Not applicable: The product does not have this feature.

Ricoh RDC-300, RDC-2E

These two new cameras from long-time industry player Ricoh share similar feature sets and a similar ergonomic design. Differences lie in their resolutions and target markets: The Ricoh RDC-300 ($499 list) with 640-by-480 resolution is aimed at general consumers and the mainstream business market, while the RDC-2E ($599 list) with 768-by-576 resolution is designed for high-end business users and discriminating hobbyists. Both units produce excellent images and are likely to please their intended audiences.

Each camera is compact enough to fit in a shirt pocket, and each unit can capture native JPEG files. Both cameras offer three compression modes, a self-timer, a 1.8-inch color LCD (a removable option on the RDC-2E), continuous NTSC video-out capability, a date/time stamp, and an accurate auto-white balance function.

Even a novice will be able to capture images right away by simply installing four AA batteries and turning the unit on. Buttons are well labeled and easy to understand, and controls are located in a panel on top of the camera under the hinged LCD, which doubles as a viewfinder. You'll need to hold the unit flat in both hands to shoot. The flash is located a bit close to the edge, so we had to be careful not to cover the bulb with a finger when taking a picture.

Software bundled with each camera includes a Twain driver and utilities, along with Ricoh's PhotoStudio Lite for the RDC-300 or PhotoStudio with the RDC-2E. This package provides all of the usual editing tools plus templates for calendars, greeting cards, and brochures. You can also organize images into albums, which can then be presented as a slide show on the on-board display, a PC monitor, or on a TV using the camera's video-out line.

The entry-level RDC-300 has 4MB of built-in memory, enough to store up to 25

	UMAX MDX 8000, Vivitar ViviCam	Yashica KC 600
		Ends
	$400 street	$500 street
	1,000 x 800	640 x 480
	0.33-inch CMOS	0.33-inch CCD
	816,000	350,000
	30-bit	24-bit
	■	■
	2.5MB (UMAX), 0.5MB (Vivitar)	None
	PC Card flash (proprietary)	CompactFlash
	133 / 89 (UMAX), 100 / 25 (Vivitar)	65 / 8
	Wavelet	JPEG
	50	100
	Glass	Glass
	50 mm (UMAX), 38 mm (Vivitar)	47 mm
	■ ■	■ ■
	N/A / N/A	N/A / 8 inches
	Optical	Optical and LCD
	N/A	1.8 inches
	■	■
	■	■
	On, off, auto	On, off, auto, fill, red-eye reduction
	4–12 feet	3–10 feet
	■	■
	115	57
	■ ■	■ ■
	■	■
	■ ■ ■	■ ■ ■
	■ ■	■ ■
	■	■
	■	■
	■	N/A
	Thermal dye ($400)	N/A
	1 year	2 years
	■	■
	www.umax.com, www.vivitarcorp.com	www.yashica.com

images in fine mode, 50 in normal, and 100 in economy. The RDC-2E has 2MB of internal memory and accepts removable CompactFlash memory cards. In addition to standard still mode, the RDC-2E offers a continuous mode, which captures one frame each second, up to 41 frames.

In general, both cameras are able shooters, and we were very pleased with their test results. The RDC-2E outshone its less expensive sibling, thanks to its higher native resolution. But each camera's low-resolution images looked the same. Indoor shots with both units showed outstanding color balance and proper flash coverage; the units had good scores on our Color Accuracy test. Details were sharp, with clean midtones and pleasing skin tones; highlights were not washed out, and shadow definition was very good.

Outdoor images in bright sun had excellent color saturation. For both cameras, close-up and document-copy images using macro and special document modes were outstanding, with good contrast, excellent color balance and depth of field.

The RDC-300 is an above-average entry-level camera with outstanding features at a good price; users looking to try out digital photography without a big investment should look here. The RDC-2E offers additional sophistication and higher resolution that make it well worth the extra money. Both have fine image quality and are excellent options for business applications and more.—*JK*

Ricoh RDC-300. List price: $499.
Ricoh RDC-2E. List price: $599. Ricoh Consumer Products Group, Sparks, NV; 702-352-1600, www.ricohcpg.com. *Choose 532 at www.pcmag.com/infolink.*

SUITABILITY TO TASK	
RICOH RDC-2E	
Family	Good
Business	Good
Semiprofessional	Good
RICOH RDC-300	
Family	Excellent
Business	Good
Semiprofessional	Fair

Sharp VE-LC1U

Intended for business users, the Sharp VE-LC1U ($500 street) comes with a few sensible features that will prove useful for its intended audience. Unfortunately, image-quality limitations and the lack of some basic items—most notably flash and removable storage—diminish its appeal.

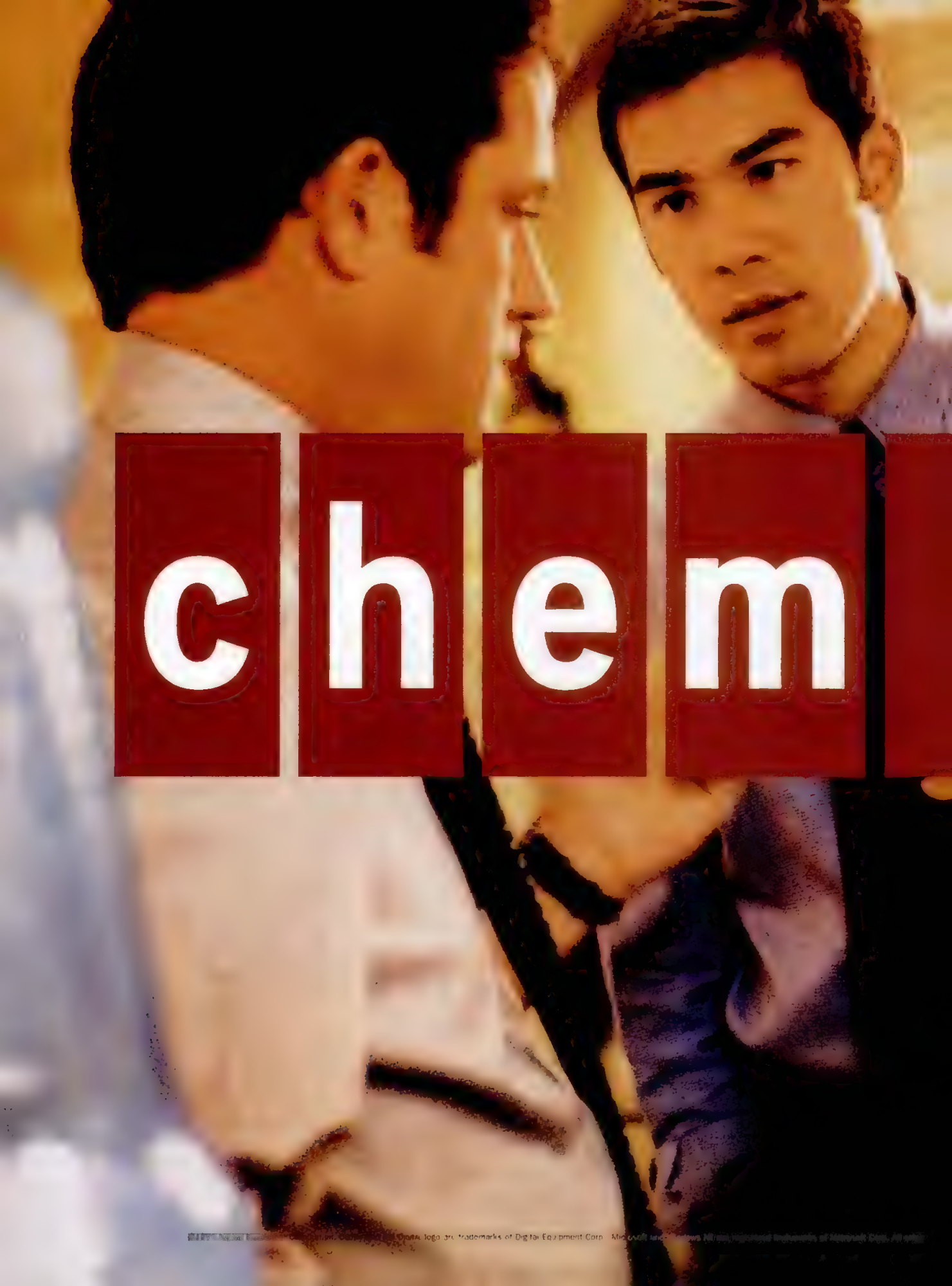
SUITABILITY TO TASK	
SHARP VE-LC1U	
Family	Fair
Business	Fair
Semiprofessional	Poor

The VE-LC1U has a sleek, high-tech design and a lens that swivels independently from the rest of the camera. There is no optical viewfinder, however, so you must rely on the LCD panel, which diminishes battery life. The LCD panel is also used for viewing the configuration menu, which is fairly easy to navigate. The few available settings leave you limited control over the image. You can choose between two aperture settings, but there are no exposure settings.

The camera responds quickly to pressing the shutter but takes about 12 seconds (with fresh batteries) to process an image and be ready for the next shot. There is no removable storage, so you have to rely on the 4MB of internal flash to store images (enough for 30 to 108 images, depending on mode). Conveniently, the camera does have an infrared window, and it comes with an IrDA adapter for a PC's serial port for wireless transfers. The VE-LC1U comes with a Twain-compatible driver, plus some handy software, including a utility that lets you stitch together images to create panoramic shots.

During testing, image quality was adequate, given the other limitations. Even though the camera did fairly well with low-light settings, the lack of a flash prevented it from capturing details that other cameras detected. In high-contrast environments, such as a sunlit outdoor setting, the bright areas were washed out and lost almost all detail. In general, the images were of below-average quality.

According to a Sharp representative, a similar model, the VE-LC2 ($699 list), will replace the current offering soon after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you read this. The new unit will be nearly identical to the one tested here, but it will add an optical viewfinder and will be housed in a slightly smaller body.

Although the VE-LC1U is easy to use, it has limited features and lacks image quality. The unit may work for casual use, but there are other cameras that offer better performance for the price.—*AP*

Sharp VE-LC1U. Street price: $500. Sharp Electronics Corp., Mahwah, NJ; 800-237-4277; www.sharp-usa.com. *Choose 533 at www.pcmag.com/infolink.*

Sony DSC-F1, Mavica-FD5, Mavica-FD7

Sony offers three digital cameras aimed at business users and the PC hobbyist. The Sony DCS-F1 ($500 street) has a host of standard features and an elegant design. Although its 640-by-480 resolution and lack of removable storage options will limit its appeal for demanding business users, its top-notch image quality makes it one of the more desirable VGA cameras on the market. The groundbreaking Sony Mavica-FD5 ($599 list) and Mavica-FD7 ($799 list) are the only cameras on the market to use standard floppy disks for image storage. Here again, the 640-by-480 resolution makes them ill suited if top-notch images are a must. But the convenience of floppy disk transfer makes them ideal for many business applications.

The DSC-F1 contains 4MB of internal flash memory that stores up to 108 images. It comes with a rechargeable lithium ion battery, continuous NTSC video-out, automatic and manual exposure modes, a built-in flash, a self-timer, and a 1.8-inch color active-matrix LCD. Transferring files is easy, thanks to the bundled serial cable and the built-in IrDA port. You can also use the camera as a TV presentation device, thanks to the NTSC video-out port. There is even a slide-show mode that will scroll though stored images in correct order; special bundled software lets you add effects and text to produce a complete visual presentation. Software includes a Twain driver, an import and album utility, and ArcSoft's PhotoStudio for advanced image editing.

Shooting with the Sony DCS-F1 is fun. The unit is lightweight and comfortable to hold. We found the auto-exposure very accurate in most situations, and the camera's manual override let us adjust both primary exposure and flash up to two stops over and under the metered values.

During fine and standard captures, the camera took about 2 seconds to get ready for the next shot—quick for this class. We did run into one annoying glitch: Without warning, the camera went dark during testing and would not go back on until we removed the battery for about a minute and powered everything up again. A company technician confirmed that the camera misfunctions like this on rare occasions and that removing the battery resets the device to normal.

Photos taken with the DCS-F1 showed good contrast and pleasing color. The camera was a top performer on our Color Accuracy test, and in general the product produced very good color saturation and skin tones.

Sony offers a matching optional thermal dye printer, the DPP-M55 ($500 street), which can be connected via the camera's wireless port or via a PC's parallel port connection. You can control the printer from the camera's printer menu. Color and contrast on the postcard-size printouts compared very well to the source picture.

Sony has done an admirable job with both the camera and the printer. The rich feature set and robust controls provide the less demanding user an effortless source of images.

One of the inconveniences with current digital cameras is file transfer: To get images from the camera to your PC, you have to put up with a slow serial connection or have a PC Card drive attached to take advantage of the removable storage (if the camera offers any). And if you want to shoot a lot of pictures in the field, you have to have several flash memory cards on hand—a significant added expense.

Enter the innovative Mavica digital cameras, which store their JPEG images directly to standard 3.5-inch floppy disks. Each Mavica can take up to 500 pictures on a single charge of its reusable lithium ion battery. Both models come standard with a 2.5-inch color LCD and ArcSoft's image-editing software PhotoStudio. The cameras can each store 20 images of highest quality or up to 40 of standard quality on a single disk. The MVC-FD7's higher cost buys a 10:1 optical zoom lens (compared with the MVC-FD5's fixed lens), a manual focus override, and macro capacity. The MVC-FD7 also provides four preprogrammed special effects modes: monochrome, pastel, negative image, and sepia.

The Mavicas are heavier by over a pound apiece and bulkier than other digital cameras, the result of their built-in floppy disk drives. Shooting is easy and intuitive, and most users will be able to start shooting without even reading the well-written manual. The display shows all menu options.

Images taken with the Mavicas show pleasing skin tone, good color saturation, and reasonable contrast. The picture quality is about average for a 640-by-480 camera on both fine and economy settings. We did notice some jaggies on diagonal lines, but the level of detail was very good, especially in shadow areas. The built-in flash does a good job of covering the subject at normal working ranges but tends to wash out if the subject is too close.

The floppy disk storage offers a cheap and easy way to keep images, and the 6 seconds or so the camera needs to store an image and be ready for the next

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shot is less time than some of the flash memory–based units we tested. Best of all, getting pictures into the PC is incredibly easy: Simply slip the disk into your PC and double-click on the image file.

The only oversight to the Mavica design is the lack of video-out capability for using the cameras as presentation devices. Although they are more expensive than other units that deliver VGA resolution, the cost and productivity savings of the floppy disk storage will quickly justify the small initial price premium.—*JK*

Sony DSC-F1. Street price: $500. **Sony Mavica-FD5.** List price: $599. **Sony Mavica-FD7.** List price: $799. Sony Electronics Inc., San Jose, CA; 800-352-7669; www.sony.com\image. *Choose 534 at www.pcmag.com/infolink.*

Sound Vision SV mini-209

Aimed at business users and photo enthusiasts, the Sound Vision SV mini-209 ($479 direct) is the most affordable high-resolution (1,000-by-800) camera in this roundup. But mediocre image quality and glitches during standard operation will limit its appeal for more demanding buyers.

This sleek unit has a CMOS sensor for image capture, a coated glass lens, and an optical viewfinder (though there is no LCD). It can record 20 seconds of sound annotations, and it includes videoconferencing features and a video-out port. The camera can save JPEG images to standard removable PC Card flash memory or to Jeida PC memory cards.

Shooting with the SV mini-209 was sometimes problematic. When battery power was low—a frequent problem—the camera had to be reinitialized by pointing it at a bright light. The unit's long recovery time—23 to 33 seconds—precluded its use for quick candid or action shots. On the plus side, the camera does offer an automatic flash-fill mode to illuminate backlit subjects properly.

On outdoor shots, there was good detail in the images. Colors, however, were saturated but inaccurate, and there was severe clipping of the highlights. Worse, the lens created a funhouse mirror–like undulation and distortion on the sides of buildings. Our indoor test image looked muddy—there were no true whites or highlights—and the colors were muted.

With its high resolution and its video-out and voice annotation capabilities, the SV mini-209 has the features business users need, while its low price puts it within the reach of most PC hobbyists. Unfortunately, image quality keeps this camera from being a contender.—*DG and SWG*

SUITABILITY TO TASK

SOUND VISION SV MINI-209	
Family	Fair
Business	Fair
Semiprofessional	Poor

SUITABILITY TO TASK

TOSHIBA PDR-2	
Family	Fair
Business	Good
Semiprofessional	Poor

Sound Vision SV mini-209. Direct price: $479. Sound Vision Inc., Framingham, MA; 508-270-0027; www.soundvisioninc.com. *Choose 535 at www.pcmag.com/infolink.*

Toshiba PDR-2

Designed for field professionals and business users, the Toshiba PDR-2 ($450 street) is a good choice for those who need a highly portable digital camera for quick and easy image captures out of doors. Though it's just right for its target market, it isn't appropriate for family use or for photography hobbyists because of its low resolution and lack of a flash for inside shots.

Weighing only 5 ounces including the battery and memory card, the Toshiba PDR-2 incorporates a PC Card interface and a CMOS image sensor with a maximum resolution of 640-by-480. The unit comes with a lithium ion battery and two 2MB SmartMedia cards, each of which can store 24 fine-mode and 48 standard-mode images. It does not have an LCD, so you can't review photos in the field without downloading them to a PC.

The Toshiba PDR-2 is simple to use, and framing images is easy with the optical viewfinder. There's a delay of about 2 seconds, however, from the time you press the shutter to when the image is actually captured; this is followed by a 7-second wait before you can take another shot. Though this is great for shooting bent fenders or rental cottages, the unit is less fit for working with squirming pets or children.

The Toshiba PDR-2's file-transfer capability is hard to beat. Just unfold the PC Card connector, insert it into a notebook or desktop PC, and transfer the stored images. Your PC will treat the camera like a small-capacity drive.

On our tests, the Toshiba PDR-2 had some problems with color accuracy; its score in this area was at the low end of fair. As you would expect without a flash, indoor shots were relatively fuzzy and dark, with little fine detail. Outdoor shots proved better, the limiting factor here being the camera's VGA resolution. Given its lack of a flash and low resolution, the Toshiba PDR-2 performs adequately for its price and is worth a look for outdoor business use.—*BB*

Toshiba PDR-2. Street price: $450. Toshiba America Information Systems, Irvine, CA; 800-288-1354, 714-461-4955; www.toshiba.com/taisisd/dsc. *Choose 536 at www.pcmag.com/infolink.*

UMAX MDX 8000, Vivitar ViviCam 3000

These two cameras, designed and manufactured by Sound Vision, are identical twins. They are targeted at frugal home and business users who want simple, inexpensive devices capable of producing

photographs at a moderate resolution. Despite problematic image quality, both the Vivitar ViviCam 3000 and the UMAX MDX 8000 deliver on this limited promise for $400 (street).

Built around a CMOS sensor rather than a CCD, each camera comes with 0.5MB of built-in memory and requires six AA batteries. Each has a fixed-focus glass lens that keeps everything from 4 feet to infinity in focus. To compensate for the low ISO equivalency of 50 (which generates somewhat dark exposures), the cameras capture images in 10-bit color rather than 8-bit. The bundled software also features automatic white balance.

Each unit can accommodate a full-size flash memory PC Card for removable storage. Unfortunately, the cameras only accommodate the nearly obsolete non ATA-compliant Jeida cards, so you can't use the cards for quick image downloading in a standard PC Card slot. Users can annotate each picture with 5 seconds of sound, and a tiny LCD control panel on top of each camera reports status information and provides image and sound customization options. There is a live capture mode for videoconferencing, but no video-out port.

Shooting with these units can be frustrating. When the batteries run low (which happens frequently), both cameras must be reinitialized by pointing the camera at a bright light source. Unfortunately, you can still take pictures when power is so low that nothing gets captured at all—and you won't discover this until you try to download your images. As with most other cameras we tested, there's also a delay of more than 1 second between pressing the shutter and capturing the image, and recovery time between shots is a long 24 to 40 seconds.

In our Labs, we saw a great deal of noise in low-light situations. Our test shot showed good dynamic range, with strong, true blacks and good midtones and whites; but bright colors were muted and there was a slight yellow tinge over the entire picture. Focus and depth of field were good, but the lens produced a high degree of distortion: The sides of skyscrapers appeared wavy and undulating, as if seen in a funhouse mirror. On the whole, until these image quality problems are overcome, we can recommend the UMAX and Vivitar cameras only for the most budget-minded consumers.—*DG and SWG*

Family	Fair
Business	Fair
Semiprofessional	Poor

VIVITAR VIVICAM 3000

Family	Fair
Business	Fair
Semiprofessional	Poor

Family	Excellent
Business	Good
Semiprofessional	Good

UMAX MDX 800. Street price: $400. UMAX Technologies Inc., Fremont, CA; 800-562-0311, 510-651-4000; www.umax.com. *Choose 537 at www.pcmag.com/infolink.*

Vivitar ViviCam 3000. Street price: $400. Vivitar Corp., Newbury Park, CA; 800-352-7481, 805-498-7008; vivitarcorp.com. *Choose 538 at www.pcmag.com/infolink.*

Yashica KC 600

The Yashica KC 600 ($500 street) packs a lot of features into an inexpensive package. Aimed at the general consumer market and at PC hobbyists, it fills the bill thanks to its ease of use, excellent range of options, and good image quality for a unit with 640-by-480 resolution.

The KC 600 resembles a traditional point-and-shoot camera. There is a built-in flash, an optical viewfinder, and a 1.8-inch color LCD viewfinder, as well as an LCD status monitor. A 2MB removable Compact Flash memory card is also included.

The camera is comfortable to hold and easy to operate. For most pictures, just put the camera in auto mode, compose your shot, and shoot. Sliding down the lens cover turns on the camera and activates the top LCD panel, which gives you information on the current mode, exposure setting, and any other active options. You can compose your shots in the rear LCD, but the optical viewfinder is accurate, and using it instead will conserve battery life. We had no problems importing pictures: You can use either the bundled serial cable or the flash card in a third-party PCMCIA reader.

Our only complaint with the KC 600 concerns the manual. It covers all of the features but does so in a jumbled mix of languages wrapped around one set of illustrations. Users will find it terse and hard to understand.

During testing, we obtained good images with pleasing color saturation using the auto-exposure setting. The manual override option was handy for more difficult lighting situations, such as a backlit subject. Because of the relatively low resolution, there was some jaggedness visible on the edges of sharp diagonal objects. Skin tone and flash coverage were well within the acceptable range. In general, the Yashica KC 600 is a solid performer with all the tools you'll need to get started in digital photography. It is well worth its price.—*JK*

Yashica KC 600. Street price: $500. Yashica Optical Division, Kyocera Electronics Inc., Somerset, NJ; 800-526-0266, 732-560-0060; www.yashica.com. *Choose 539 at www.pcmag.com/infolink.* PC

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Networking

Instant

a Teamware/Virtual Office product

GROUPWARE

Need a quick way to connect scattered team members? These seven teamware products provide many of the best features of enterprise groupware—without the IS hassles or expense. **By Greg Alwang**

No man is an island, especially in the world of business. We've come to rely on a variety of electronic methods that help get the job done, including e-mail messaging, threaded discussions, and document sharing. To collaborate electronically, larger organizations install enterprise groupware applications such as Lotus Notes and Microsoft Exchange; smaller outfits, which don't have IS support, rely on Internet e-mail to share documents (and hope their Word attachments will arrive intact). As a smaller business grows, groupware looms as a necessity for doing business, requiring a dedicated server and a full-time support professional to maintain the system.

TEAMWARE STEPS FORWARD

Enter today's budding crop of teamware applications. Often called virtual-office products, these Web-enabled collaboration packages offer many of the features

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Which teamware product works best for you? Come see our interactive comparison chart at PC Magazine Online to decide.

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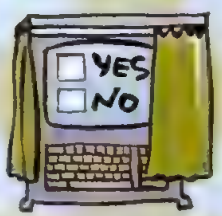
ILLUSTRATIONS BY GARY HALLGREN

Tools for the Team

Most teamware products are easy to set up and use. Feature sets, though, range considerably. Here's the scoop on which products have the tools you need.



Voting

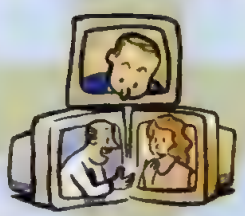
An excellent companion to discussion, a voting feature can be invaluable when discussions bog down. Only **eRoom** and **3-2-1 Intranet!** offer this feature.

Calendaring and scheduling

If your team needs robust calendaring and scheduling, you'll need to get it elsewhere. Only **3-2-1 Intranet!** includes this feature, but it's cumbersome to use. **HotOffice Virtual Office Service** and **Netscape Virtual Office by Concentric** promise it in upcoming versions.

Customizable interface

Netscape VO is the only product that gives you complete control over a site's appearance. **HotOffice** lets users and administrators rearrange icons, but most other products let you add only a company logo or a plain-text message to the main page.



Discussion

Discussion, emerging as the cornerstone of teamware, is an excellent way for teams to capture debates and facilitate brainstorming. The **Lotus-based products** have the strongest features and sophisticated threading capability. Except **Netopia VO**, each of the products includes an adequate discussion tool.

of traditional groupware—minus the investment and need for IS support. Most provide a central meeting place on the Internet where all of a project's communications and documents can reside. When you type in the dedicated URL from a browser, you're presented with a Web page that serves as your team's common workspace.

From there, you can perform a number of tasks, depending on the product you're using. You can review the team's mission statement, check deadlines and instructions posted by the team leader, leave e-mail for other members, initiate or join a discussion or real-time conference, and post documents.

The benefits of teamware abound in terms of ease of use, cost, and performance. Most products require little time to set up (ranging from a few minutes to an hour). The prices of "hosted" versions, in which the vendor handles the server-side applications, range from a one-time $50 charge to a $5 to $25 monthly fee per user. The products require no IS support: One team member can perform the administrative duties, or the members can share the tasks. And they're fast enough to be usable even at 28.8 Kbps.

Most of the products in our roundup provide hosted services. We also tested a client/server package targeted at the corporate intranet, Instinctive Technology's eRoom. A second such product, Thuridion's CREW, was not available for inclusion in our roundup.

DIFFERENT STROKES

Each vendor answers the question "What is teamware?" a little differently. Products like Changepoint Corp.'s involv.net, Lotus Instant!Teamroom, and Netscape Virtual Office focus heavily on threaded discussion features, whereas most others provide adequate but limited discussion boards without threading. HotOffice Virtual Office Service and Netscape Virtual Office by Concentric provide each user with an e-mail account. Other packages let you communicate via e-mail only with team members within the program, or expect you to use your own e-mail package (which can be a blessing if you'd like to avoid another mailbox.) Only Internet Media's 3-2-1 Intranet! provides calendaring and scheduling, and eRoom and 3-2-1 Intranet! each provide a useful voting utility.

Several of the products provide limited real-time features. HotOffice and Netopia Virtual Office provide text chat and a link to Microsoft NetMeeting, and 3-2-1 Intranet! provides a link to Mirabilis' ICQ, a real-time communications program. (For a look at the real-time collaboration features you'll find in your browser, see the sidebar "Real-Time Tools Under Your Nose." And for a rundown of real-time communications utilities, see the sidebar "Chat for the Workplace.")

The products also differ in implementing document management. eRoom, HotOffice, and Netopia Virtual Office provide robust capabilities, such as drag-and-drop file transfer from the desktop to the office space, integration into Microsoft Office applications, and document versioning. With 3-2-1 Intranet! you must use a third-party FTP utility for file sharing; the other products can perform document sharing only via embedded file attachments in messages. (For a look at two products that focus on document management, see the sidebar "Dealing with Documents.")

Two products—Netopia VO and 3-2-1 Intranet!—reflect unique visions of what teamware should be, focusing on features such as remote control and database collaboration. But Netopia VO omits threaded discussion, and 3-2-1 Intranet! is weak on document management, potentially limiting the products' appeal.

The package that provides the most well-rounded feature set is HotOffice, our Editors' Choice. Its tool set is tightly inte-

Our Contributors: GREG ALWANG and LES FREED are contributing editors of *PC Magazine*. ROBERT P. LIPSCHUTZ is the director of the Technology Center for Silicon Valley Internet Partners. KRISTINA DENIKE was the project leader, and TONI F. KISTNER was the associate editor in charge of this story.

Real-time conferencing

Real-time features add another dimension to collaboration, giving team members a quick way to connect. HotOffice and Netopia VO include text-based chat with links to NetMeeting for whiteboarding, videoconferencing, and document sharing, while 3-2-1 Intranet! includes a link to ICQ. Unique to Netopia VO are real-time features including audio conferencing and a remote-control facility.

E-mail

Only HotOffice and Netscape VO provide Internet e-mail addresses for every user, while HotOffice also includes a built-in e-mail client. Netopia VO and 3-2-1 Intranet! provide messaging capabilities between team members within the program. All the other programs offer some level of integration with existing e-mail accounts, from simple notifications to full send/receive capabilities. This approach can be a plus if you don't want to have to check yet another e-mail box.

Document management

In case you need to manage multiple documents as part of your project, several products provide specific tools for the task. eRoom, HotOffice, and Netopia VO provide outstanding capability; each lets you post documents in folders and subfolders, and each offers simple uploads and downloads. eRoom even lets you track document versions. 3-2-1 Intranet! requires that you download a third-party FTP application for file transfers. All the other products are limited to sharing files as attachments.

grated and offers Web-based e-mail, threaded discussion capability, and real-time chat. For small workgroups considering network connections for file sharing, Hot Office may be a suitable replacement. It also provides links to stock quotes, search sites, and Internet yellow pages, and other links will be added soon.

BUILDING AN OFFICE

Picking a package with the best set of features is only part of the challenge. You'll also want to consider how easy a product is to set up and use, how well its parts work together, and whether it's customizable.

For the most part, these products are easy to set up, administrate, and use right out of the box. Simply obtain your URL, user name, and password from the vendor and log on to the site. (Instant!Teamroom and involv.net will even send notification messages to your team, complete with log-on information.) In addition, you can designate any team member the administrator, and the products make easy work of adding users and defining access rights.

The price for this level of ease is the use of canned templates: The products provide little or no control over the look of the workspace. HotOffice lets you rearrange a few icons, and other packages let you add a company logo or plain-text welcome message. The notable exception is Netscape VO. Because it uses Netscape's Web server, discussion server, and e-mail server, setup requires some know-how; but if you envision building a custom Web page for your team, look no further.

SAFETY NET

If you need to communicate with outside team members but don't want to grant access to your corporate LAN, a teamware product makes sense. But if security is a prime concern, you might want to bypass Netscape VO, which makes its servers available directly on the Internet with no authentication. Consider 3-2-1 Intranet! if it suits your needs; you can configure it to run over Secure Sockets Layer (SSL).

The products that incorporate Java or ActiveX components into their architectures —eRoom, HotOffice, and Netopia Virtual Office—won't work through a firewall right away. But their vendors offer straightforward reconfiguration methods, so you can enable the features you need.

Editors' Choice

- HotOffice Virtual Office Service

PC MAGAZINE EDITORS' CHOICE

Although the field of teamware products shows promise, we believe the products's spotty feature sets and disparate philosophies will make it difficult for users to figure out which product best suits their team's needs.

The notable exception is HotOffice Virtual Office Service. HotOffice's feature set is rich, well balanced, and intelligently geared toward small businesses.

We find centralized document management a key element to productive team collaboration. The trouble is that most products omit that feature, relying instead on posting documents and embedding attached files within threaded discussion messages. HotOffice provides a central location to store all your relevant documents, browsable by author, department, date, and project. Users can publish documents to HotOffice by dragging files from the desktop or by clicking a toolbar icon within Microsoft Office applications.

Unique features include a reminder utility and phone-message utility, as well as links to search engines, shipping companies, stock tickers, and more. The combination of an e-mail client and document management capability even make HotOffice a suitable LAN replacement for small groups.

Though every product can boast at least one or two unique and innovative features, a combination of threaded discussion and centralized document management is the most effective. Aside from HotOffice, only eRoom, a client/server product, includes both capabilities, though its discussions are not threaded.

Suitability to Task

PC MAGAZINE EDITORS' CHOICE

POWER	eRoom	HotOffice Virtual Office Service	Involv.net	Lotus Instant!Teamroom	Netopia Virtual Office	Netscape Virtual Office by Concentric	3-2-1 Intranet!
Installation and setup	Good	Good	Good	Good	Good	Good	Fair
Administration	Good	Good	Fair	Good	Good	Excellent	Fair
Messaging and collaboration	Fair	Good	Fair	Good	Fair	Good	Fair
Document management	Excellent	Good	Good	Fair	Fair	Good	Fair
EASE							
Installation and setup	Good	Good	Good	Excellent	Excellent	Good	Fair
Administration	Good	Excellent	Fair	Good	Good	Excellent	Fair
Messaging and collaboration	Good	Excellent	Excellent	Excellent	Good	Good	Good
Document management	Excellent	Excellent	Good	Good	Excellent	Good	Fair

To evaluate these teamware packages, we looked at the steps a small team—five members inside the office and out—would go through to put together a sales pitch. We had the team leader set up the site, not an IS person. We evaluated *power* in terms of how many features were available by default, and we rated *ease* for both administrators and members.

Installation and setup ratings reflect how powerful the default modules and interface are during the initial Web site setup. We look for clear, step-by-step instructions. Help files are also a plus. If the interface is lacking in some way, we are interested in any customization features that might improve it.

Administration refers to setting user lists and levels of security. We look for controls that provide a sensible level of granularity, including read access, write access, and the ability to create subadministrators. We look for controls to be centralized, not in multiple modules.

Messaging and collaboration includes e-mail, discussion forums, real-time chat, voting, and forms creation. Each package provides a way either to leave messages or to incorporate lists of member e-mail addresses. We also note searching and sorting capabilities.

Document management includes uploading documents and controlling multiple versions of files. Because not all team members will be running the same applications, we look for the ability to post image and text documents on the site, not just attachments. Integration with word processing or spreadsheet applications is a plus.

Instinctive Technology Inc.

eRoom 1.0

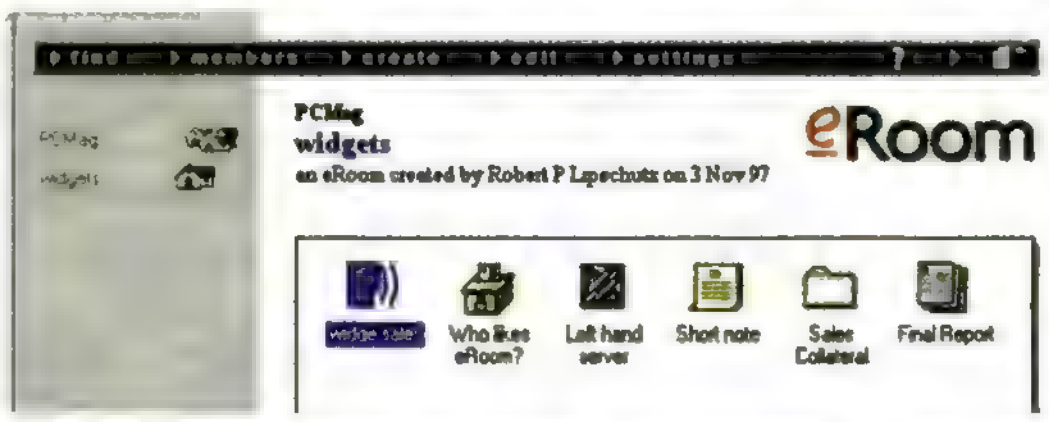
The sole client/server product in our roundup is eRoom 1.0 ($645 list for five users). Designed as a corporate intranet or extranet solution, eRoom provides powerful document management that includes versioning and integration into desktop applications. But if you need built-in e-mail or real-time collaboration, HotOffice or Netopia VO will be a better fit.

Installation and setup are straightforward. Note that because the browser-based client application is an ActiveX plug-in, using the product from a browser other than Microsoft Internet Explorer requires installing Ncompass, an included plug-in.

The administration capabilities are streamlined and powerful. The server's tab-based user interface makes adding users easy, although you'll want to add users from a browser, since doing so from the server requires shutting down eRoom. And the administrator has granular control over access to rooms and documents, with the ability to grant many levels of access rights.

The eRoom interface is built on a robust and easy-to-use document management system. Each eRoom can store documents on the top level or within folders, and folders can be nestled. Groups and folders are displayed neatly as icons, and folders called *version organizers* keep records of documents as they're altered.

You can create a document as a proprietary eRoom "note" viewable via either a browser or desktop application. To publish it, simply drag the note from the desktop into an eRoom or a folder therein. To download a file, simply drag it from eRoom to the client desktop. In contrast, eRoom's discussion features are limited: Messages are displayed as a string of unthreaded comments. A table of contents and a search utility offset this limitation somewhat, as does the ability to format messages using color and boldface and to include hyperlinks.

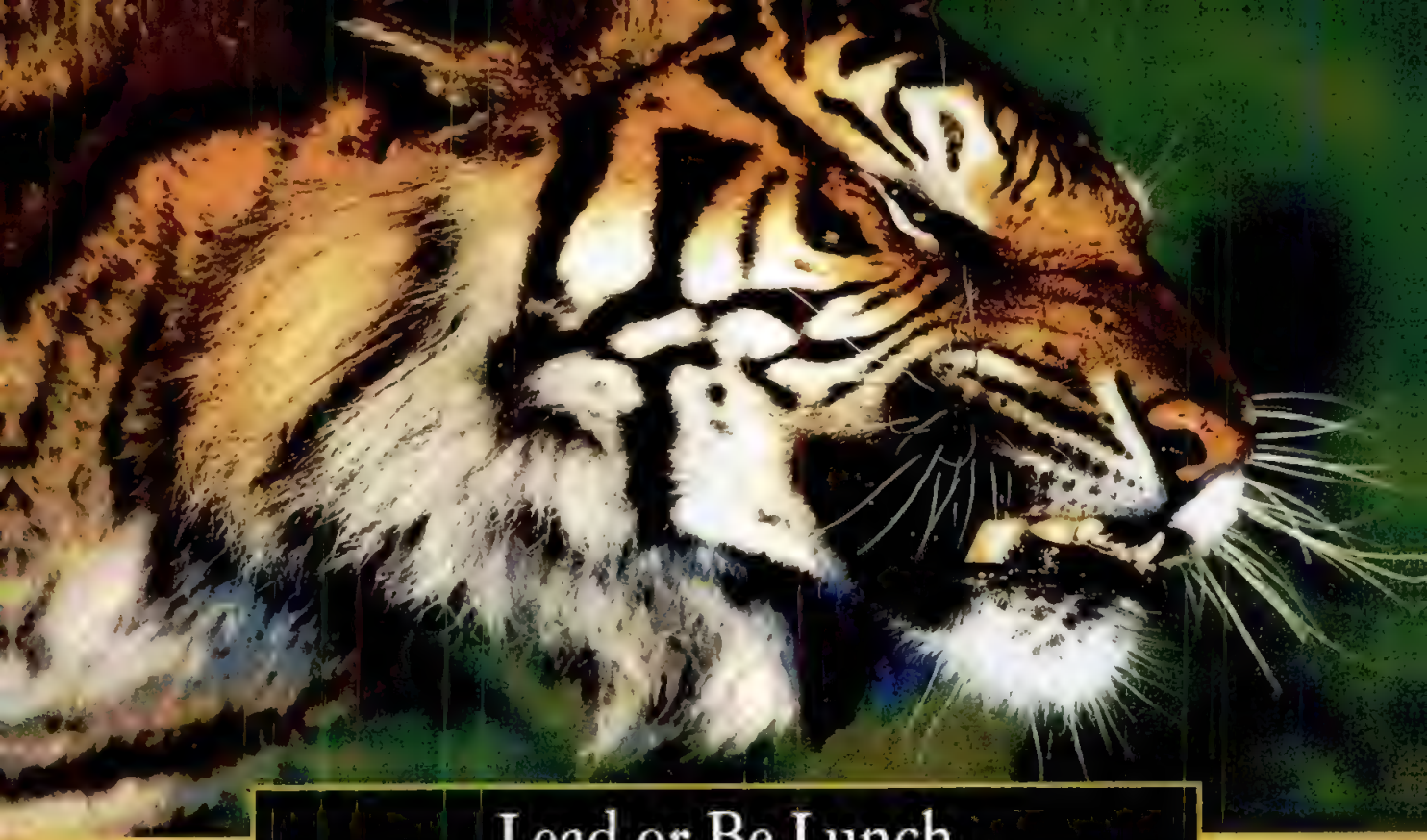


eRoom offers an excellent user-interface metaphor for document sharing: files organized into rooms.

For times when disagreement bogs down discussions, eRoom includes an excellent voting utility. Ballots can be drawn up from within discussion groups or from anywhere else in eRoom. With the click of a button, any discussion participant can post a ballot with a list of response choices and a place for write-in responses.

The package does not include any e-mail or real-time collaboration tools. In the realm of teamware, this is a significant omission, but the power of eRoom's document management may persuade some users to rely on their own applications for those features.—*Robert P. Lipschutz*

eRoom 1.0. List price: For five users, $645. Client requires: Microsoft Windows 95 or Windows NT 4.*x* (Service Pack 2 or later), 16MB RAM. Server requires: Windows NT 4.*x* (Service Pack 2 or later), 32MB RAM. Instinctive Technology Inc., Cambridge, MA; 617-497-6300; fax, 617-497-5055; www.instinctive.com. *Choose 500 at www.pcmag.com/infolink.*



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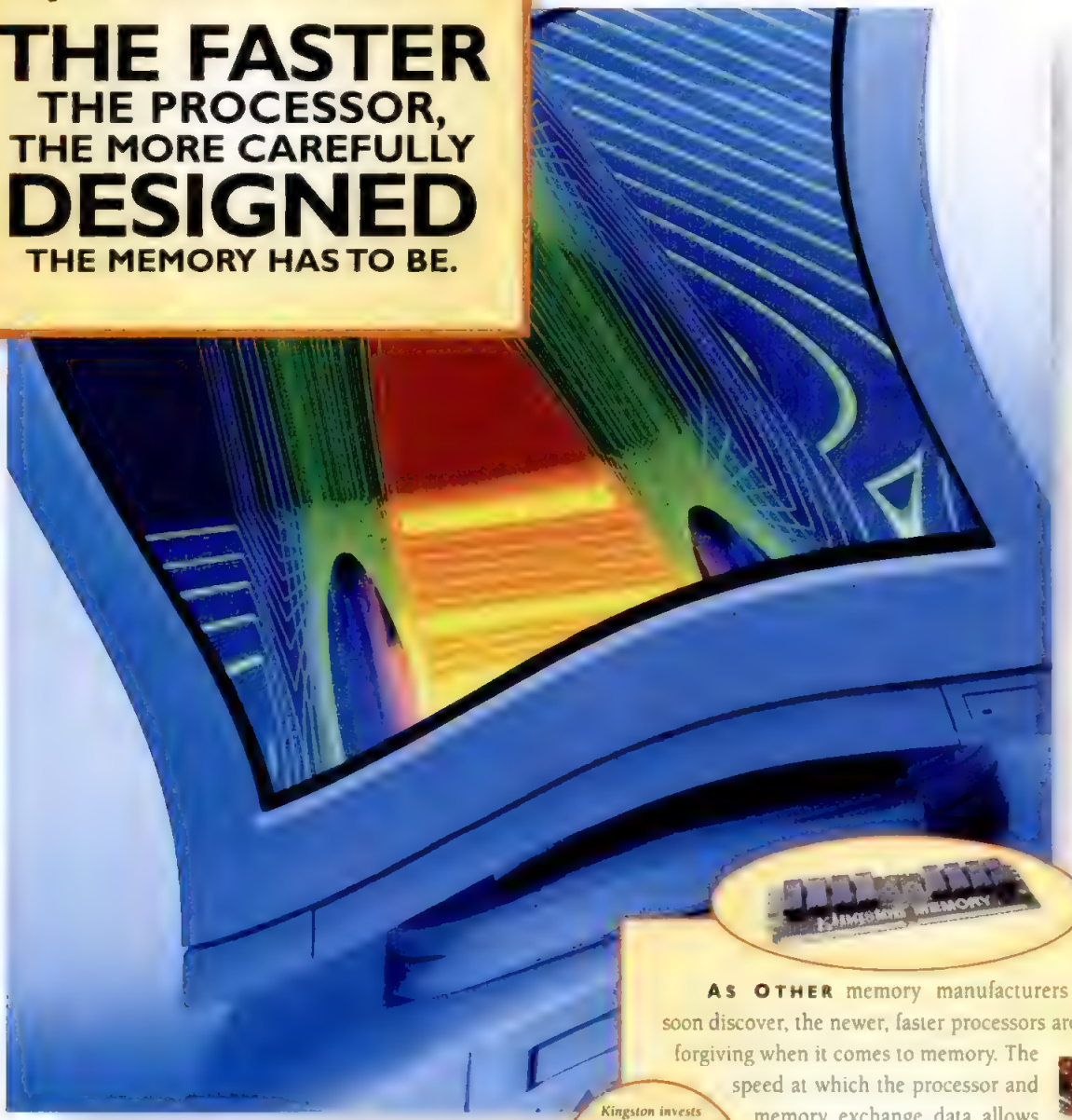

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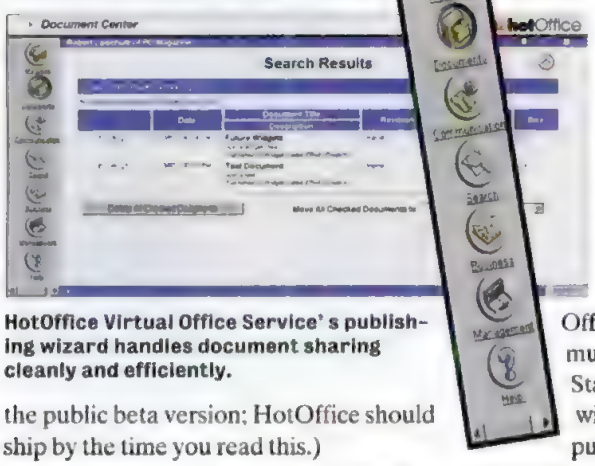
HotOffice Technologies Inc.

HotOffice Virtual Office Service

PC MAGAZINE EDITORS' CHOICE

More than any other product in this roundup, HotOffice Virtual Office Service (list price $8 to $19 monthly per user) comes close to setting a standard for teamware; as a result, it earns our Editors' Choice. An extremely well-balanced feature set includes a Web-based e-mail client, threaded discussion, document posting, and desktop integration. The package also includes features such as reminders, phone messages, and real-time conferencing. Near-seamless integration and a friendly interface round out the product. (We tested the public beta version; HotOffice should ship by the time you read this.)



HotOffice Virtual Office Service's publishing wizard handles document sharing cleanly and efficiently.

Setup and administration are simple. The administrator can add and delete users and set access rights by departments and projects. The user interface, My Desk, is somewhat customizable; the administrator can organize the top half, and users can arrange the bottom. HotOffice also has a useful, context-sensitive help utility.

Unlike any other teamware product, HotOffice has customizable icons that provide links to search sites, to sites of shipping companies such as Federal Express and UPS, and to Quote.com for stock quotes. HotOffice may have additional links by the time you read this.

For users without e-mail accounts, HotOffice includes a well-implemented e-mail client with a simple address book. Folders make it easy to organize messages, and messages can include links and attachments. A reminder utility lets you send e-mail messages at preset intervals, and another utility lets the person who answers your phone forward a message to your HotOffice e-mail account.

The discussion features are flexible but too permissive. Users can create new topics, and threading shows the flow of messages. You can make discussions available to specific departments or for individual projects, and you can restrict user access. But in testing, we found that HotOffice let anyone with access rights delete any message. We expect the problem to be fixed by the time you read this.

The real-time collaboration tools include a simple text-based chat feature with multiple rooms. There's a link to Microsoft NetMeeting for whiteboarding, application sharing, and videoconferencing.

HotOffice's document management is by far the best among the hosted products in this roundup and rivals that of eRoom. With its e-mail client, HotOffice can replace LANs for very small workgroups.

Documents are posted in folders on the site, browsable by author, department, date, and project. To publish documents from Microsoft Office 95 and 97 applications, you must install the HotOffice Starter Kit; it adds a publishing wizard to the desktop and a publishing icon to each Office application's File menu. To publish a file created in another application, simply drag the file to the HotOffice Publisher icon on the desktop. The wizard works smoothly, but posting documents is sometimes quite slow. Controls let you make the published document available to all team members or to a select number.—*RPL*

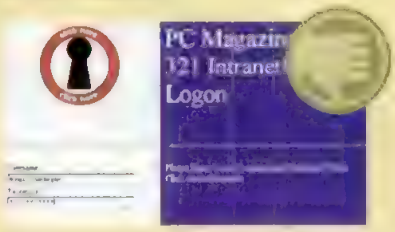
HotOffice Virtual Office Service. List price: $8 to $19 per user per month. Requires: Microsoft Internet Explorer 3.02 or later or Netscape Navigator 3.01 or later. HotOffice Technologies Inc., Boca Raton, FL; 561-995-0005; fax, 561-995-5990; www.hotoffice.com. *Choose 501 at www.pcmag.com/infolink.*

Changepoint Corp.

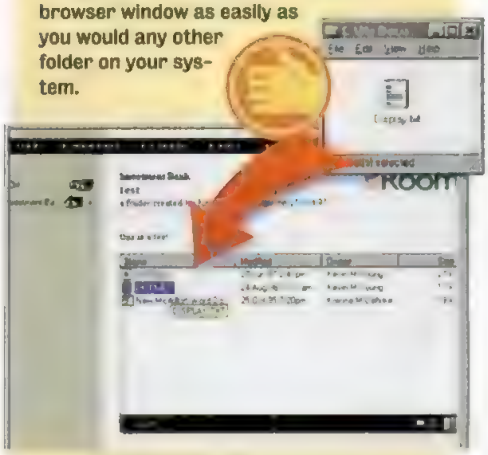
involv.net

If you split a groupware package four ways and put For Rent signs on each, you'd have a vision of involv.net. Changepoint Corp. lets you rent one or more of

Multiple Passwords One password won't give you access to all the user features of 3-2-1 Intranet!. You need separate passwords to belong to more than one workgroup or to use the third-party FTP program you'll need for file transfers.



Drag-and-Drop File Transfer eRoom's virtual rooms become an extension of your desktop. You can drag and drop files into or out of your browser window as easily as you would any other folder on your system.



Desktop Application Integration HotOffice installs a *flame* button to all Microsoft Office applications that lets you publish files to your virtual office with the push of a button.

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HP Idea Kits

If you can imagine it, you can print it.

four collaborative Web applications—Group Discussion, Project Collaboration, Resource Locator, and Software Manager—for as little as $5 per user per month. involv.net combines some of the best that Lotus Notes has to offer, including excellent discussion databases, multiple views of your data, and powerful search capabilities, at an economical price.

As with most of the hosted solutions, setup is straightforward. When you rent an application, you receive an e-mail confirmation indicating your administrator user name, password, and the URL for your site. You can't alter the site's appearance other than to add a logo to the home page or navigation frame, but the interface is easy to use and quick to load.

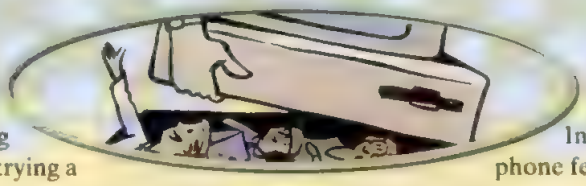
Administration is simple for single applications but unnecessarily complex for more than one. The administrator defines who can access the application, but if you're using multiple applications, there is no way to import user profiles between applications. Though this is a huge headache, most small workgroups will need to rent only one application. Team members can be designated managers (who can add members and delete documents), or clients (who can only post discussion documents). Each new member automatically receives an e-mail invitation that includes the workgroup URL, a user name, and a password.

The Group Discussion application ($10 per user per month) supports discussion threads, file attachments, and views by date, topic, category, or author, but it doesn't include e-mail capability. The hierarchical views are easily expanded or collapsed, giving you the feel of a Lotus Notes client. A nifty group e-mail button lets your existing mail client address a message to all or selected team members.

Project Collaboration ($25 per user per month) is the most comprehensive offering, with the power to track all aspects of a project. In addition to discussion, it supports task assignments, due dates, hourly estimates, task status, and Web links. As you assign project tasks to team members, the application notifies them via e-mail. Attaching files to discussion documents is easy, as is detaching them, but that's the limit of the application's document management features.

More specialized modules include the Resource Locator ($5 per user per month),

Real-Time Tools Under Your Nose



Thinking about trying a real-time collaboration tool? You may need to look no further than your browser. Both Microsoft Internet Explorer 4.0 and Netscape Communicator 4.0 bundle products that provide whiteboard, chat, and file-transfer features. Microsoft NetMeeting 2.1 also includes videoconferencing capability and application sharing, while Netscape Conference 4.0 adds collaborative browsing to the mix.

NetMeeting runs on Microsoft Windows 95 or Windows NT 4.0 independent of IE4—which means that you can also run it using Navigator. Six collaboration applications—videoconferencing, application sharing, whiteboard, file transfer, chat, and Internet phone—provide multiple ways to get your point across.

The application-sharing and collaboration tools let users share and collaborate on documents and work jointly within an application. You can guide someone through a Web site by sharing a browser application, for instance, or explain a financial spreadsheet to a colleague. There's one-on-one videoconferencing, and a whiteboard tool lets you collaborate freehand on a shared work surface.

Despite the variety of features, the effectiveness of NetMeeting depends on available bandwidth. Although we found the application-sharing and videoconferencing applications to be excellent productivity tools, both require at least an ISDN connection to be truly useful. We found the chat, file-transfer, and Internet-phone functions impractical at modem speeds. And one caveat: The videoconferencing and Internet-phone features use UDP streams that may be blocked by your company's firewall. A NetMeeting Resource Kit and SDK is also available free for building your own collaboration solutions.

Conference is the new version of the Netscape product formerly known as CoolTalk, which was bundled with Netscape Navigator 3.0. Although its feature set lacks the richness of NetMeeting's—there's no videoconferencing or application sharing—because it's part of Communicator, your colleagues are already set up to use it if they have Navigator.

Conference includes whiteboarding, collaborative browsing—so you can walk someone through a Web site (but not an application)—file transfer, and a simple chat program. Its Internet-phone capabilities require a sound card on each end of the connection. Sound quality, however, was mediocre. We found collaborative browsing to be Conference's most useful tool.

There are several standalone products on the market with similar features. For other options, you may want to explore products from VocalTec (*www.vocaltec.com*), VDOnet (*www.vdonet.com*), Connectix (*www.connectix.com*), and Intel (*www.intel.com*).—*RPL*

Microsoft NetMeeting 2.1. Free. Microsoft Corp., Redmond, WA; 800-426-9400, 425-882-8080; fax, 425-936-7329; www.microsoft.com. *Choose 507 at www.pcmag.com/infolink.*

Netscape Conference 4.0. Free. Netscape Communications Corp., Mountain View, CA; 800-638-7483, 650-254-1900; fax, 650-528-4124; www.netscape.com. *Choose 508 at www.pcmag.com/infolink.*

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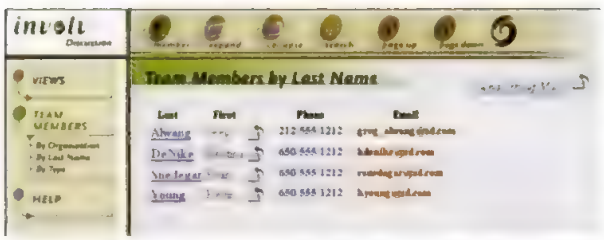


involv.net has a group e-mail option for sending e-mail to all members of your workgroup.

which provides a virtual in/out board for tracking team members, and the Software Manager ($750 per workgroup per month), which tracks product revisions and bugs.

Larger workgroups looking for a more comprehensive client/server solution might consider involv.net's big brother, involv Intranet. Not finished in time for testing but available at press time, involv Intranet requires a dedicated Domino server ($5,000 plus $40 to $90 per user). It includes all the features of involv.net as well as contact management, event planning, advanced document management, issue management, real-time chat, and sales processing. The interface is one of the best HTML implementations we've seen, incorporating tabbed pages in an easy-to-navigate and comprehensive fashion.—*Greg Alwang*

involv.net. List price: $10, $25, and $5 per user per month for Group Discussion, Project Collaboration, and Resource Locator, respectively; $750 per workgroup per month for Software Manager. System requirements: Netscape Navigator 3.0 or higher or Microsoft Internet Explorer 3.01 or higher. Changepoint Corp., Richmond Hill, ON, 800-263-7189, 905-886-7700; fax, 905-886-7023; www.involv.net. *Choose 502 at www.pcmag.com/infolink.*

Lotus Development Corp.

Lotus Instant!Teamroom

Lotus Instant!Teamroom (list price $14.95 monthly per user) is the first in a series of Lotus Domino–based rentable applications available on the Web. Although it doesn't offer e-mail and real-time collaboration, the product is easy to set up and use, and it has powerful tools for threaded discussion and document management.

Lotus's approach to providing a teamware product is unique. Rather than selling Instant!Teamroom directly, it offers subscriptions through its "Alliance Partners"—ISPs that offer public servers for Lotus Notes. At press time, Instant!-Teamroom was available from Interliant, Netcom On-Line Communications, and US West.

Setup was among the easiest in this roundup. To create an account, we simply connected to *www.lotus.com*, selected a service provider, and entered the payment information. The account initiator is designated as the team administrator. (Any user can be designated as an administrator, and any administrator can add users.) That person enters users' names and e-mail addresses into a form, and the Instant!Teamroom server automatically sends each user an e-mail containing the server's URL, the user name, and a password.

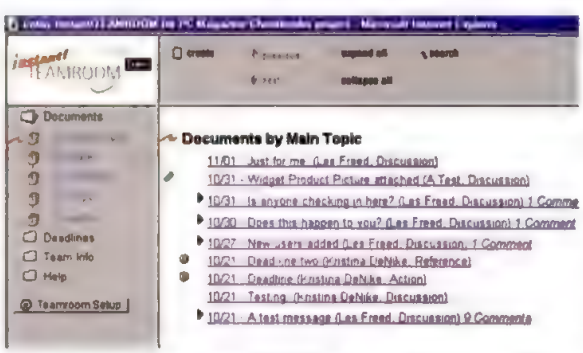
Administrators can place short, plain-text messages on the "welcome" page, but no graphics or logos. To enter the site, users must click an icon on the welcome page, so it's an ideal place to post global messages. Unfortunately, there's no easy way to format such messages in boldface or color so that they stand out against the existing text; as a result, they're easy to miss.

Because of the use of Lotus Notes, Teamroom's threaded discussion capabilities are of unmatched depth and sophistication. You can view a list of discussions or a message thread on one topic, or you can sort by topic, subject category, date, document type, or author. To view all the messages for a topic, you simply select the top-level message and click the expand icon. A handy feature lets users or administrators attach deadlines to discussions as incentives to keep them moving.

Instant!Teamroom's threaded discussion area serves as the document manager. You can choose a type for each document (action, discussion, reference, or tech brief), or you can create your own classifications. But although the use of document types is helpful, the classifications look alike on-screen. We'd like to see an ability to attach icons or to color-code each type, so the user can better distinguish them.

Performance was only fair. Instant!-Teamroom's Java-based client was one of the slower programs to load, and it occasionally crashed our browser.—*Les Freed*

Lotus Instant!Teamroom. List price: $14.95 per user per month. Requires: Microsoft Internet Explorer 4.*x* or Netscape Navigator 3.*x*. Lotus Development Corp., Cambridge, MA; 800-575-6887, 617-577-8500; www.lotus.com. *Choose 503 at www.pcmag.com/infolink.*



Lotus Instant!Teamroom's strong suit is its threaded discussion database. Icons on the left side give you an item's status without your having to open it.

Netopia Inc.

Netopia Virtual Office 2.0

Targeted at small, dispersed corporate workgroups, Netopia Virtual Office ($49.95 as a download, $69.95 for a shrinkwrapped version) is a bargain. If you're lured by an easy-to-use package that includes remote-access features, limited messaging, real-time collaboration, and excellent file-sharing capabilities, you've found your teamware—but only if you can forgo a discussion feature.

Netopia VO's approach to teamware is unique: Each Virtual Office has one owner and multiple (unlimited) visitors. After a 5MB download for the owner programs, setup takes only five minutes. Visitors can download all client plug-in components at once (3.5MB), or opt to download each as needed.

Upon accessing a Virtual Office, you're confronted with the conference room Office Door. You can "knock" and request an online conference. If the owner is not online, you can upload to the in-box, peruse the public out-boxes, and leave a message that pops up when the owner next logs on. If you don't have a dedicated Internet connection, you can set Netopia VO to connect to the site and check for messages at predefined intervals.

Netopia VO is the only

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Akia's Radiance LCD Monitors give you something a typical monitor doesn't: space. Though they save room on your desk, they deliver a beautiful image that's better than yesterday's behemoth CRTs. And for those wondering, "just how good of a picture can an LCD deliver?" Consider that Radiance VX145, with built-in speakers, has a 1024 x 768 resolution producing a high-contrast, high-quality image that's distortion and flicker free. Add to all this an unheard of $1,499 price tag and you'll see that great-looking LCD monitors are finally a real option.

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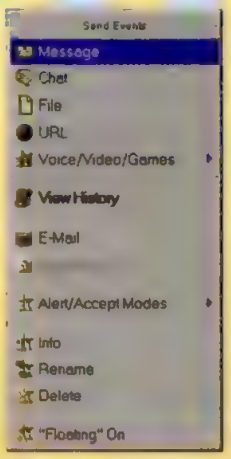
Chat for the Workplace

A new breed of real-time communications applications is trying to carve out a corporate niche. Instant messaging applications like Activerse's Ding!, ichat Pager, and ICQ let you predefine a contact list of users (who also need the program) and alert you when those users come online. Once connected, you can send a message, file, or Web pointer or enter a real-time chat room.

Activerse's **Ding! 1.0 beta 4** (free for noncommercial use; $29.95 for businesses) was simple to install. Registering with the Ding! Switchboard added our Ding! address (or WhoDP) to the Four11 and Ding LDAP directory servers for others to find. Ding! runs as a Java application on Microsoft Windows 95, Windows NT, and Solaris, with additional versions in the works. Ding! requires a network reconfiguration to work through a firewall, though. (Activerse Inc., Austin, TX; 800-235-9274, 512-708-1255; fax, 512-708-1293; www.activerse.com. *Choose 509 at www.pcmag.com/infolink.*)

ichat Pager 1.1. (free) provides a richer feature set that includes scheduled pages and support for both text and audio streams. Registering puts you in ichat's directory service, giving you access to anyone else connected with the service. Pager works on Windows NT, Windows 95, Macintosh, and PowerPC.

Pager sits on the toolbar of your desktop or can be launched at startup; click on the icon to launch a window containing a list of ichat members. For privacy, you can allow people to view just your name or your name with additional details.



ICQ can launch other applications based on messages you send across the wire.

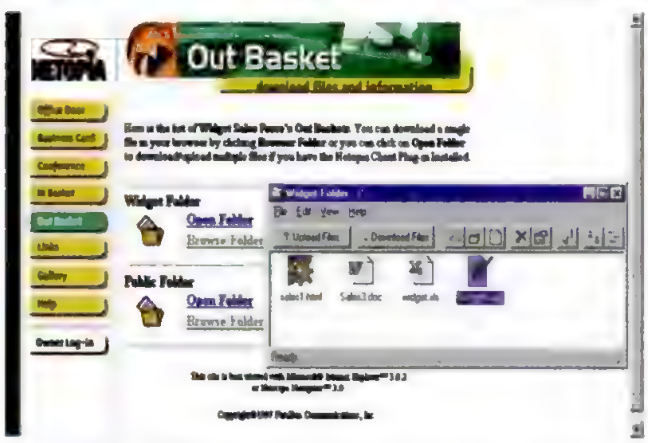
For a more serious implementation, the ichat Paging System also offers servers, firewall proxy, and administration tools so you can run your own Internet or intranet system. (ichat Inc., Austin, TX; 888-242-8669, 512-425-2200; fax, 512-719-8225; www.ichat.com. *Choose 510 at www.pcmag.com/infolink.*)

Mirabilis's **ICQ 1.113 beta** (free) is a more robust solution, providing a full set of real-time collaboration tools including the ability to launch multimedia applications. The program can send the usual types of information types, including messages, URLs, and files. Users can also initiate private or multiuser chat sessions. ICQ can also serve as a launch point for other collaboration tools, such as VDOnet's VDOPhone or White Pine Software's CU-SeeMe.

In addition, ICQ will cache your messages, files, or URL transmissions until a recipient comes back online. Searching can be done by e-mail address, name, or Universal Internet Number (UIN). For privacy, you can reserve the right to authorize any user wanting to send you messages, or you can choose to ignore specific people. (Mirabilis Ltd., Tel Aviv, Israel; 972-3-6488090; fax, 972-3-6488095; www.mirabilis.com. *Choose 511 at www.pcmag.com/infolink.*)—*RPL*

product to feature remote-control functions borrowed from Netopia's popular product Timbuktu. Look lets a visitor view an owner's screen—ideal for training and hands-off collaboration. Control gives you remote control over the owner's PC. Aside from collaboration, Control is an ideal solution for mobile workers who need to access information frequently or run applications from an office PC.

Netopia VO lets you send file attachments via e-mail, but only one way—from visitor PCs to the owner PC. It is possible to configure all users as owners to facilitate bilateral messaging, but that's an awkward management solution at best.



Netopia Virtual Office features a powerful Out Basket applet that lets you upload and download files to public or private folders easily.

Netopia VO's real-time conferencing features are the best we've seen, including a text-based chat feature and an Intercom feature that provides audio-conferencing. However, these features work only between the owner and one visitor. Netopia VO also includes a link to NetMeeting 2.1.

Netopia VO's document management features are powerful and easy to use. Outbox, the file transfer applet, floats over the browser window, letting you upload or download files with a mouse click. You can create private folders and subfolders with granular access rights, great for distributed workgroups that lack an FTP site for distributing documents.

We tested a late 2.0 beta; the shipping version should be available by press time. Version 1.1 was severely limited because the owner's PC had to be on in order to access the Virtual Office. In version 2.0, major ISP Geocities hosts the Netopia Virtual Offices, putting them more in line with other hosted products we tested.—*GA*

Netopia Virtual Office 2.0. List price: Download, $49.95; boxed version, $69.95. System requirements: 486DX/33 (486DX/100,

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sound card, microphone and speakers for the Intercom feature), 8MB RAM, 15MB hard disk space, TCP/IP or PPP connection. Netopia Inc., Alameda, CA; 510-814-5000, fax 510-814-5020; www.netopia.com. *Choose 504 at www.pcmag.com/infolink.*

Concentric Network and Netscape Communications Corp.

Netscape Virtual Office by Concentric

In a field marked by easy-to-implement products, Netscape Virtual Office (starting at $29 for a single user) is the only hosted product aimed at technically savvy users. The Netscape VO package is built on Concentric's web, mail, and NNTP discussion servers. The result is a polished suite of teamware tools strong in messaging and customization but weak in document management and integration. To use Netscape VO to its fullest potential, you'll need lots of time and a fair amount of expertise.

Virtual Office provides plenty of flexibility: The Web server gives you a place to publish "broadcast" information, the discussion server provides a forum for one-to-many interactive discussion and file sharing (via attachments), and the e-mail server provides team members with full-fledged messaging capability. But because the servers are available directly on the Internet, security is of greater concern than with the other hosted products.

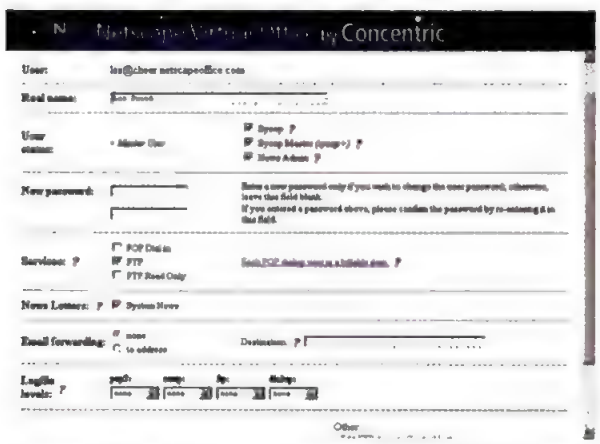
Unlike the other hosted products that require just a Web browser and a credit card to get up and running, Netscape VO users need an e-mail client, newsgroup reader, and Web browser—all of which are provided by Netscape Communicator 4.0 (and IE 3.0 and up). This approach means users must switch among Communicator components to take full advantage of Netscape VO's features, though. Also, you need to configure the e-mail and newsgroup software manually for each server, a simple but time-consuming procedure for each group member.

Because the Web page is located on a Web server, we had full control over the look of our site via HTML. Netscape VO's well-designed administration interface makes managing the site easy, letting you add and delete users, manage discussion groups, and control server access. Administrators can inspect and fine-tune virtually every aspect of each server's operation and generate detailed reports on traffic, disk usage, and logging.

The discussion server let us create multiple discussion groups for different aspects of our project. We could set varying degrees of user access to each discussion as well as create private discussions.

Both the discussion and e-mail servers support file attachments, but other than that, Netscape VO has no document management features or central location to store documents. But it has excellent control over formatting discussion and e-mail messages. They can contain a mixture of formatted text, graphics, and HTML code—a marked improvement over standard Internet e-mail messaging and that of the other products.—*LF*

Netscape Virtual Office by Concentric. List price: Starts at $29 per month. Concentric Network, Cupertino, CA; 408-342-2800; fax, 408-342-2810; www.concentric.net. Netscape Communications Corp., Mountain View, CA; www.netscape.com. *Choose 505 at www.pcmag.com/infolink.*



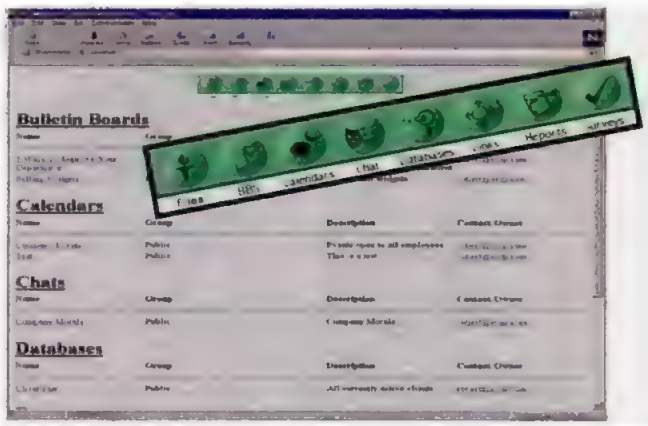
Netscape Virtual Office by Concentric's user editor lets administrators add, delete, and modify the access rights of individual users.

Internet Media Inc.

3-2-1 Intranet!

Although 3-2-1 Intranet! (list price $9.95 per user per month) has many collaboration staples, such as threaded discussion and document management, we found the features poorly implemented compared with those of other products. But unique features such as calendaring and the ability to create collaborative databases and newsletters may make the package tempting for some groups.

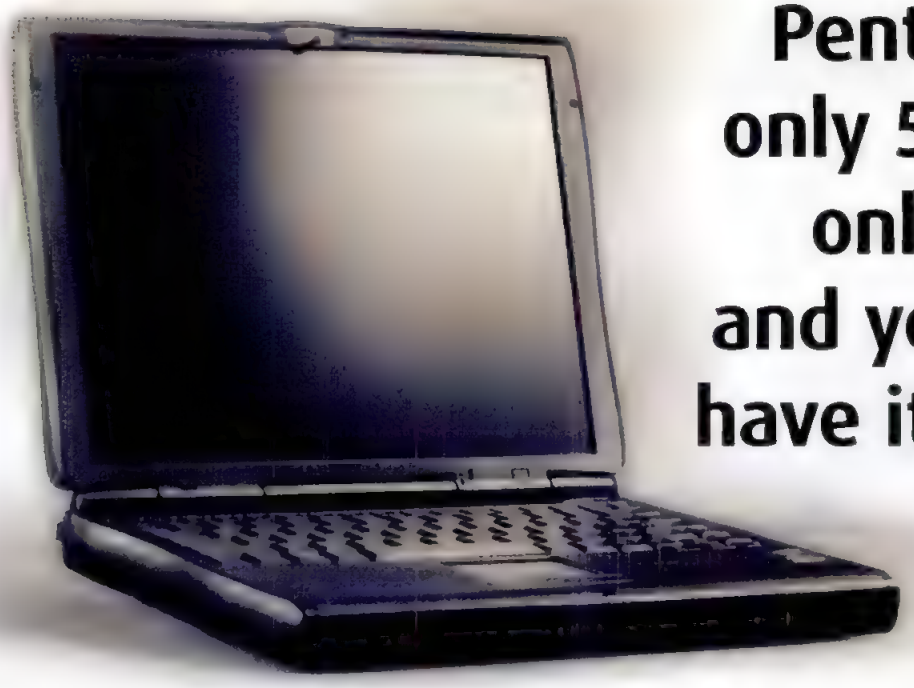
Although we found setup and administration relatively easy, group membership options are limited: The administrator can assign a user either to all groups, to a single group, or to a public group (which permits access only to information on a public site). The only way to give a user access to a select number of groups is to assign a separate password for each.



3-2-1 Intranet! offers several utilities, but the standout feature is the unique collaborative databases.

The interface is complex, poorly integrated, and confusing. Rather than providing a central workspace, 3-2-1 Intranet! spreads all applications and data across personal, group, and company workspaces. In each workspace, you can choose from multiple applications—such as bulletin boards, calendars, databases, surveys, newsletters, and file libraries—but they're presented in an unorganized manner.

The package's unique collaborative-database capability is useful for groups that need to share lots of structured information. To set up a database, the administrator simply enters the database fields, then allows access by either a single group or the entire organization. Users can add, search, view, and edit records. Information is entered into HTML forms and displayed



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SUMMARY OF FEATURES See www.pcmag.com for interactive views

Teamware

PC MAGAZINE EDITORS' CHOICE

■ YES NO	eRoom 1.0	HotOffice Virtual Office Service	involv.net	Lotus Instant!-Teamroom	Netopia Virtual Office 2.0	Netscape Virtual Office by Concentric	3-2-1 Intranet!
List price (per user per month, except where noted)	5 licenses with server, $645, 25 licenses with server, $3,225	$19	Project Collaboration, $25; Group Discussion, $10; Resource Locator, $5	$14.95	$49.95 flat rate	$29.00	$9.95
Platforms supported	Client: Windows 95, NT 4.*x*; Server: Windows NT 4.*x* (SP2 or later) running MS IIS 2.*x* or 3.*x*	Windows 95, NT 4.0	Windows 3.*x*, 95; Unix (with IE3 or Navigator 3 or later)	Any platform with a browser	Windows 95, NT	Windows 3.*x*, 95, NT	Any platform with a browser
Web Site Design and Administration							
Administrator can edit HTML directly			■	■			
Administrator can register domain name	■			■		■	■
Group alerts via e-mail	■	■	■	■			
Administrator can set levels of user access	■	■	■	■	■	■	■
Works with standard Web browser	■	■	■	■	■	■	■
Requires plug-ins or helper controls	■	■			■		
Supports remote administration		■	■	■	■	■	■
E-Mail							
Integrates with standard Internet e-mail	■	■	■	■		■	
MIME attachments	■	■	■		N/A	■	N/A
S-MIME attachments	■		■		N/A		N/A
Uuencoded attachments	■	■	■	■	N/A		N/A
Uses a proprietary messaging client		■			■		■
Formatted text/Graphics/Forms	N/A	■■■	N/A	N/A		N/A	■
Clickable URLs	N/A	■	N/A	N/A		N/A	
Discussion and Voting							
Supports two levels of threaded discussion	■	■	■	■	N/A	■	■
Supports unlimited levels of threaded discussion			■	■	N/A	■	
User can perform Boolean searches	■		■	■			
User can search by date/topic/full text	■■■		■■	■■■			
User can cast ballots and tally votes	■						■
Calendaring and Scheduling							
Administrator can publish calendar	N/A						■
Administrator can post preexisting calendar on site	N/A		■				
User can view scheduler by day/week/month	N/A			■ ■			■ ■
User can view scheduler by user	N/A			■			
User can add links to discussions	N/A	■		■		■	
Supports task scheduling	N/A		■	■			
Searches for free time slots of invitees	N/A					■	
Real-Time Features							
Built-in real-time text chat		■			■		
Built-in real-time audio/video					■		
Supports third-party real-time communications	■	■			■		
Supports multipoint chat (more than two users)		■			■ (via NetMeeting)		
Document Posting and Management							
User can post text pages	■	■	■	■	■	■	■
User can post images	■	■	■	■	■	■	■
Public or private posting areas available	■	■	■	■	■	■	■
Check-in and checkout	■	■					
Concurrency control/Versioning	■■						
Forms Creation							
Includes tools for forms building	■			■			■
All users can access and complete forms	■		■	■			■

N/A—Not applicable: The product does not have this feature.

Dealing with Documents

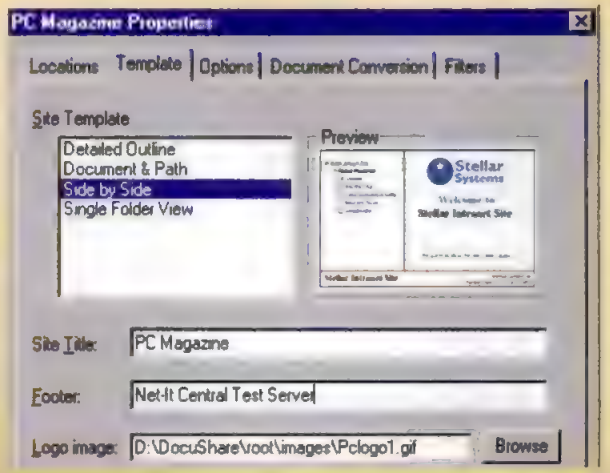
Teamware products are good multipurpose collaboration tools, but many users don't need another other communications tool beyond e-mail and the telephone. What they do need is an efficient, universal way to share electronic documents.

Innovative products from Net-It Software and Xerox Document Management Systems enlist the Web's help in managing and distributing documents better by posting them as a collection of Web pages viewed and downloaded via a Java-enabled browser.

Xerox's **DocuShare 1.0** ($695 list for a single server and 25 clients to $995 for 50 clients) converts documents into HTML files you publish via a Web server. Although DocuShare lacks Net-It's extensive file-conversion capabilities, it provides excellent tools for file organization and annotation. Collections can contain files, URLs, text messages, and calendars. The program has no user interface of its own—all access to files is performed through a browser.

An included search tool makes easy work of locating a specific document or group of documents without navigating through the collection. Each document is tagged with a descriptive name, comment line, author, posting date, and file size. To view a document, simply click on the name. If it is viewable within the Web browser, the document will appear in the browser window; if it requires an external application to launch (as would a spreadsheet), DocuShare downloads the file to the client PC.

DocuShare runs only on Microsoft Windows NT Server 4.0 with Microsoft Internet Information Server (IIS) or on Sun Solaris 2.5. Installation is simple; all files install from the DocuShare CD-ROM in about five minutes. (Xerox Document Management Systems, Palo Alto, CA; 800-428-2995, 650-424-0111; www.xerox.com/products/docushare. *Choose 512 at www.pcmag.com/infolink.*)



Net-It Central comes with four predefined display templates. You can customize them or build your own using HTML.

Net-It Central 1.0 ($1,995 list for 100 documents, $4,995 list for unlimited documents, $6,995 list for API.) is like a document funnel: Pour document files into one end, and a formatted set of HTML pages that you can publish with any web server emerges from the other. Net-It Central is expressly designed for use inside a corporate firewall, and as such it doesn't provide any user authentication or access control.

Net-It Central uses Net-It Software's proprietary jDoc technology to perform the file conversion. We tested Net-It Central with a wide variety of files; it consistently created an accurate, online-viewable representation of the original document. Downloading the original document (in the original format) to a user's PC takes only a click on an icon.

Net-It Central's only shortcomings are the lack of version control and the lack of a mechanism for users to add comments or annotations to document files—two features we liked best about DocuShare.

Net-It Central requires Microsoft Windows 95 or Windows NT 4.x.—*LF*
(Net-It Software, San Francisco; 888-638-4844, 415-551-0600; www.net-it.com. Choose 513 at *www.pcmag.com/infolink.*)

in no-frills tables. The tables are appropriate for simple data such as contact lists, inventories, and records of customer calls, but entering long data fields is awkward.

The product also includes a powerful forms generator. Simple HTML form templates let administrators create forms, surveys, and newsletters—an effective way to capture and display user information.

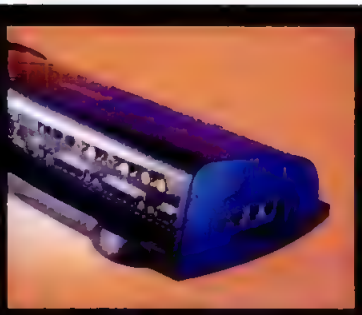
The discussion capability is fairly good. The administrator can create threaded discussions, with hyperlinks, for both specific groups and the whole company. Oddly, the messages we created often extended beyond the text box. (This didn't happen as we viewed messages we received.)

The product's calendaring feature—the only one in this roundup—is marred by a severe lack of integration. Handling personal, workgroup, and companywide events takes three separate calendars, and you can display them only in single-month views. But the calendars' forms-based interfaces makes them easy to modify.

There's no e-mail client, but you can send messages to any other 3-2-1 Intranet! user, create and send alarms, and contact the administrator of a threaded discussion group. (To read the message, the recipient must have a valid e-mail address and client.) The package doesn't include any real-time collaboration features now but should by the time you read this.

File uploading requires a third-party FTP utility, so it is not likely to be an intuitive operation for many users. The administrator can create links to uploaded files, group them for viewing by either some or all groups, and create a public site for posting downloadable files.—*RPL*

3-2-1 Intranet! List price: $9.95 per user per month. Requires: AOL browser, Microsoft Internet Explorer 3.*x*, Netscape Navigator 3.*x*, or Web TV. Internet Media Inc., Dallas; 214-954-0055; fax, 214-954-0059; www.iminet.com. *Choose 506 at www.pcmag.com/infolink.*



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TravelMate 7100 (233MHz)	8:25
IBM ThinkPad 760ED (133MHz)	2:38
Toshiba Tecra 720 CDT (133MHz)	2:38
Dell Latitude Xpi (150MHz)	4:15

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Net Tools

Printer Freedom

Print servers let you place your printer anywhere on the LAN and offer a host of management features.

By Steve Rigney

Printing is fundamental. Users want to be able to print easily and reliably. Economics still drives the use of shared network printers, and you get the best flexibility and reliability by connecting printers to the LAN through a standalone print server. While print servers are pretty basic, you've got to get the fundamentals right to keep both users and network managers happy.

We gathered a group of eight print servers designed to meet the needs of a LAN or subnet with about 2 to 100 client PCs. We asked for standalone devices with at least two printer ports and the ability to work with multiple protocols, including TCP/IP and IPX. Our product group consists of the Axis PrintPoint 560/100, the D-Link DP-300, the Emulex NETQue PRO2, the HP JetDirect EX Plus3 Print Server, the Intel NetportExpress PRO/100, the Lexmark MarkNet Pro 3, the Linksys EtherFast 3-Port 10/100, and the Osicom NETPrint 1000. The products range in price from about $350 to $650.

The value of standalone network print servers is often overlooked because every NOS on the market lets you attach a printer to a PC or server and share

ILLUSTRATION BY STEPHEN SCHUDLICH

INSIDE

PRINT SERVERS Today's print servers come with multiple printer ports, support multiple networking protocols, and feature Web-based management.

PC Labs and contributing editor Steve Rigney put eight print servers to the test to see which one belongs on your network.

PUSH SERVERS The last time we tested push server products, we were less than impressed and suggested that most organizations would be better off sticking with e-mail. In From the Bench, contributing editor Les Freed tests the newest version of BackWeb Server to see whether we're likely to change our minds any time soon. *Page 225.*

REAL-TIME REPLICATOR FOR WINDOWS NT For organizations that can't afford to be disconnected from their data even for a second, traditional backup may not be the best solution. Contributing editor Steve Rigney looks at a package from Network Integrity that continually replicates your data from server to server. *Page 225.*

FASTER CONNECTIONS With your cable company and local telephone company vying to provide you with Internet access, contributing editor Les Freed explains the difference between cable and DSL modems. *Page 229.*

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To check out this story and our online archive of networking coverage, visit our Web site.

it with the other users on the network. But standalone print servers offer better flexibility, economy, and reliability. If you share a printer connected to a networked PC, you have to find room for the PC and keep it running all of the time. And if the PC dies, you have to replace and reconfigure a whole new PC before your users can print. Standalone print servers are small enough to fit almost anywhere, and they are generally easy to install and configure.

The first standalone print servers were designed to work with NetWare, and all of the devices in this roundup stay true to that heritage. NetWare comes with two network print server applications: Pserver, which runs on a dedicated server, and Rprinter, which runs on a client PC. All of the products in this review can emulate both the Pserver and Rprinter applications. However, in this mode you must have a NetWare server on your network to handle the queues, and you must run the IPX/SPX protocol on the client PCs.

Alternatively, you can print directly to a printer that understands TCP/IP. Because TCP/IP is needed on corporate intranets and the Internet, it is finding its way onto LANs. TCP has two print utilities: Lpr and Lpd. While Unix and Windows NT include a Lpr/Lpd utility, Windows 95 doesn't. To get around this problem, EtherFast, JetDirect, MarkNet, NetportExpress, and NETPrint include proprietary software that lets you print from a Windows 95 PC using the TCP/IP protocol. Emulex provides a third-party Lpr/Lpd utility for Windows 95. The Axis PrintPoint 560/100 and the D-Link DP-300 require you to use the NetBEUI protocol to print directly from Windows 95.

Another advantage that print servers offer is that you can manage them from a remote location. While the management capabilities differ from product to product, all of the devices in this roundup let you perform tasks such as checking whether the server is up and running, resetting a hung server, and changing basic information such as the name of the device. A new trend is the use of Web browsers to manage and control the device. Of the products we tested, the Intel and Osicom offer the best Web-based management; both come with full Web servers.

Some of the physical differences among these products include the location of the power supply and the number of status lights. Wall-mounted power supply lumps block sockets, so the Intel and Osicom models each put the power supply in the cord. This reduces clutter, but some people complain that finding room for the power supply brick is a new problem. You can choose your own best solution.

There is no such thing as too many status lights. The Emulex and Lexmark units have particularly useful sets of status lights, but the HP server's test button is also a handy feature.

Read on to find the print server that best fits your needs.

Axis PrintPoint 560/100

Although physically the smallest product in this roundup, the Axis PrintPoint 560/100 is rich in features. The $499 print server offers support for every major network protocol, Web-based management, easy installation, and solid performance. Our only gripe was that when running Windows 95, the PrintPoint forced us to use the NetBEUI protocol instead of TCP/IP unless we purchased an optional package available from the company's Web site.

The PrintPoint has two high-speed parallel ports, one serial port, and an auto-sensing 10/100-Mbps Ethernet adapter. The two LEDs—one for power, the other for link—don't provide much information, but they do let you know whether the device is working.

SUMMARY OF FEATURES See www.pcmag.com for interactive views

Print Servers

PC MAGAZINE EDITORS' CHOICE

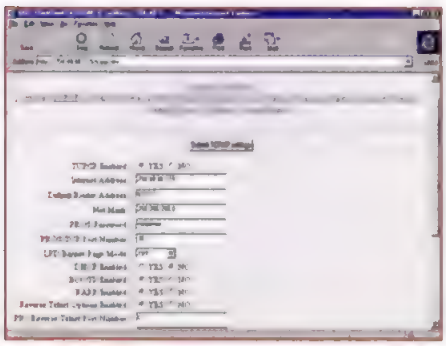
■ YES ■ NO	Axis PrintPoint 560/100	D-Link DP-300	Emulex NETQue PRO2	HP JetDirect EX Plus3 Print Server	Intel NetportExpress PRO/100	Lexmark MarkNet Pro 3	Linksys EtherFast 3-Port 10/100 Print Server	Osicom NETPrint 1000
List price of tested configuration	$499	$399	$449	$479	$499	$409	$349	$649
Ports	2 parallel, 1 serial	2 parallel, 1 serial	2 parallel, 1 serial	3 parallel	2 parallel, 1 serial	2 parallel, 1 serial	3 parallel	2 parallel, 1 serial
Ethernet connection	10/100-Mbps auto-sensing	10/100-Mbps auto-sensing	10-Mbps	10-Mbps	10/100-Mbps auto-sensing	10/100-Mbps auto-sensing	10/100-Mbps auto-sensing	10-Mbps
Works with DHCP/BootP	■■	■■	■■	■■	■■	■■	■■	■■
Works with DNS/WINS	■■	■■	■■	■■	■■	■■	■■	■■
Network Operating System								
Windows NT/Windows 95/Windows 3.x	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
NetWare/Unix/Macintosh	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
OS/2 Warp Connect	■	■	■	■	■	■	■	■
Network Communication Protocols								
TCP/IP / IPX / NetBEUI	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
AppleTalk/DLC	■■	■■	■■	■■	■■	■■	■■	■■
Management Software								
Windows NT/Windows 95/Windows 3.x	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
DOS / Unix / OS/2 Warp Connect	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
Allows remote resetting of server	■	■	■	■	■	■	■	■
Includes an SNMP agent	■	■	■	■	■	■	■	■
Supports Web-based management	■	■	■	■	■	■	■	■
Service and Support								
Warranty	5 years	Lifetime	2 years	3 years	3 years	3 years	1 year	6 years
Technical-support hours (eastern time)	8:00–8:00 M–F	3:30 A.M.–3:00 P.M. M–F	24 hours, 7 days	8:00–8:00 M–F	4:00 A.M.–2:00 P.M. M–F	9:00–9:00 M–F, Noon–6:00 Sat., Sun.	4:00 A.M.–2:00 P.M. M–F, 6:00 A.M.–1:00 P.M. Sat.	8:00–8:00 M–Th, 8:30–5:30 F

Internally the small unit can handle every major protocol, including AppleTalk, IPX, NetBEUI, TCP/IP.

We found the PrintPoint easy to set up as long as you have the proper network protocols installed on your NOS. As with the D-Link DP-300, when we wanted to print from Windows 95, we had to use NetBEUI; similarly, IPX was reserved for NetWare printing. When we used Windows NT, we could choose NetBEUI or TCP/IP.

Unlike Emulex's NETQue, which also uses native OS protocols for printing, the PrintPoint comes with a proprietary driver that makes it easy to connect your client PCs. The driver adds a port to your printer configuration and automatically uses the OS's default protocol. You can also install just the driver on a single Windows 95– or NT–based PC and use the built-in network of the OS to share the printer. Even connecting to the print server via TCP/IP is easy. All you need to do is use your existing DHCP or BootP server. If you don't have one, you can use the Address Resolution Protocol (ARP) command to issue the print server an IP address.

The most powerful feature of the PrintPoint is its built-in Web server. Like Intel's NetportExpress, the PrintPoint includes a full-blown Web server running inside the unit. The Web-based interface lets you do



THE PRINTPOINT *supports standard Web browsers for easy configuration of TCP/IP protocol settings.*

everything the bundled proprietary Windows-based utility NetPilot allows except for setting up NetWare print queues and simultaneously monitoring multiple servers.

On our tests, we used a Web browser to set up and monitor the unit. While the PrintPoint's Web configuration capabilities are just as powerful as those of the NetportExpress, the NetportExpress provides better Web-based statistics.

Axis PrintPoint 560/100. List price: $499. Axis Communications Inc., Woburn, MA; 800-444-2947, 781-938-1188; fax, 781-938-6161; www.axisinc.com. *Choose 903 at www.pcmag.com/infolink.*

EDITORS' CHOICE

• Intel NetportExpress PRO/100

A print server should install easily, work with all of the popular operating systems and protocols, and provide powerful yet ubiquitous management. Of all the products we tested, the Intel NetportExpress PRO/100 comes closest to fulfilling all these requirements.

The Netport Express is the only product in this roundup that works with just about every protocol running on any OS, and it provides as much functionality with its browser-based management as with the Windows-based proprietary utility. It was a snap to install. Added bonuses include a 10/100-Mbps auto-sensing Ethernet port and three bidirectional parallel ports. The diagnostic switch on the chassis provides an easy way to check the status of the device.

We give an honorable mention to the HP JetDirect EX Plus3. Like the NetportExpress, the JetDirect is very easy to install and allows great protocol and OS flexibility. The Windows-based utility JetAdmin provides overall network and printer status information. Unfortunately, the latest version of Web JetAdmin was in beta testing during our test cycle, and it still requires proprietary software on the browser-based management PC. As networks continue to grow and become heterogeneous and intranets become the standard, browser-based management is becoming more of a necessity than a bonus feature.

D-Link DP-300

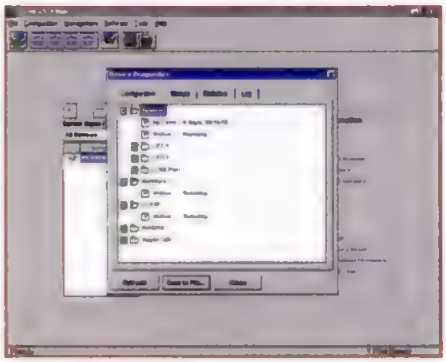
The least expensive print server in this roundup ($399 list), the D-Link DP-300 is easy to install and use. Its protocol support, however, is limited compared with that of the HP JetDirect EX Plus3 and the Intel NetportExpress PRO/100, and it doesn't offer Web-based management. Like the Emulex NETQue PRO2, the DP-300 doesn't include any client drivers or even an optional solution, so you have to print to the server using your OS's default protocols.

But the server's low price does not mean that it skimps on features. The DP-300 comes with two parallel ports, one serial port, and an auto-sensing 10/100-Mbps Ethernet port. It works with TCP/IP, IPX, NetBEUI, and AppleTalk.

Like the NetportExpress, the DP-300 is easy to install. After we set up the device and connected our printers, we simply installed the management utility PS Admin, and the software automatically found our print server. If you are using Windows 95 or Windows NT with NetBEUI, you don't have to change any configurations. You just write down the name of the device and the port, map a printer driver, and start printing. If you want to use TCP/IP or IPX, however, you need to provide an IP address or the NetWare server and queue name. Using PS Admin, we were able to configure the server to work with the different NOSs and protocols. This is the only utility you need to change the server's IP address, its name, and any other setting.

You can use PS Admin to monitor and troubleshoot the DP-300 as well as to configure it. The utility enabled us to see how many packets were going through the server and which protocol they were using. We also saw how long the unit had been running and were given the option of resetting it. The statistics were limited to device and network information, however; we couldn't gather data on the individual ports or printers. The DP-300 works with HP's Print Job Language (PJL), and if your printer supports PJL you can gather some data about print jobs and printer statistics. PS Admin even lets you see whether there are any jobs in the NetWare queue.

Because the unit uses the OS's native protocol, you don't have to install any special drivers on your clients, but you are limited in how you can print. As with the Axis unit, we



D-LINK'S PS ADMIN *keeps you current on printer status and delivers pertinent network statistics.*

could use IPX only when we were printing to a NetWare printer and NetBEUI when printing from Windows 95. With Windows NT, we could use either NetBEUI or TCP/IP.

D-Link DP-300. List price: $399. D-Link Systems, Irvine, CA; 800-326-1688, 714-455-1688; fax, 714-455-2521; www.dlink.com. *Choose 904 at www.pcmag.com/infolink.*

Emulex NETQue PRO2

Lackluster performance, difficult installation, and limited protocol support make the Emulex NETQue PRO2 ($449 list) one of the least appealing products we tested. The NETQue also lacks Web-based management and was one of three products we tested that did not provide a Fast Ethernet connection. This is a workable print server product, but it isn't at the top of our list.

The NETQue comes with two parallel ports and one serial; it also has a 10Base-T and a 10Base2 coaxial connector. LED indicators show power, network connection, and activity on each of the individual ports.

Along with the Lexmark MarkNet Pro 3, the NETQue was one of the more confusing products to install. All of the documentation is on a CD—there are no written manuals—and the online documentation we received didn't cover Windows 95. The only documentation for Windows NT was for the 3.5 version. When we asked the vendor about this, the vendor sent new documentation that included instructions for printing from both Windows 95 and Windows NT 4.0. Emulex claims that users will get the new documentation.

Like the Axis and D-Link print servers, the NETQue doesn't come with any proprietary drivers; out of the box, it forces you to use the native client printing protocol for whatever OS you have. Printing to a NetWare printer requires IPX, and when printing from Windows 95 you need NetBEUI. For Windows NT you can choose between NetBEUI and TCP/IP. Emulex tries to give you more flexibility by offering a driver to make printing directly to the server easier. However, this driver works only with TCP/IP and DLC. The 2841C also includes both Windows- and Web-based management, but the internal Web server provides only basic monitoring information. Like most of the other pocket print servers, the 2841C currently provides a 10-Mbps Ethernet connection. (Extended Systems, Boise, ID; 800-235-7576; www.extendsys.com. *Choose 911 at www.pcmag.com/infolink.*)

At $249, the **Linksys Pocket Print Server** is the second-least-expensive product reviewed here. The unit currently runs at 10 Mbps and, like its larger sibling, doesn't include Web-based management software. What we like best about the Pocket Print Server is its proprietary driver, which lets you print using almost any protocol you want. On our tests we were able to use the driver to print over TCP/IP from a Windows 95–based PC. Although the product lacks a Web interface, we found the bundled Windows-based software easy to use. If your printer has a bidirectional port, you can gather dozens of statistics, including information on print jobs and paper errors, using the management software. (Linksys, Irvine, CA; 800-546-5797, 714-261-1288; www.linksys.com. *Choose 909 at www.pcmag.com/infolink.*)

The major differences between these deck-of-cards–size pocket print servers and their larger counterparts lie mainly in their size and the number of ports. In most cases you get the same installation and management options. But except for the proprietary 140BJC, all of these pocket print servers run over 10-Mbps Ethernet connections. If you are migrating to a 100-Mbps Fast Ethernet network, you may be forced to invest in one of the multiport versions of the products from the main roundup, even if you are connecting a single printer. —*Steve Rigney*

POCKETPRINTSERVERS

Small but Mighty

The multiport print servers we review in this story are powerful, but what if you have only a single printer or need to scatter single printers all over your network? Try a pocket print server—a device that typically offers a single port but has many of the same features as its multiport siblings. Most of these small print servers emulate NetWare's Pserver and Rprinter applications and work with the major protocols, including TCP/IP and IPX.

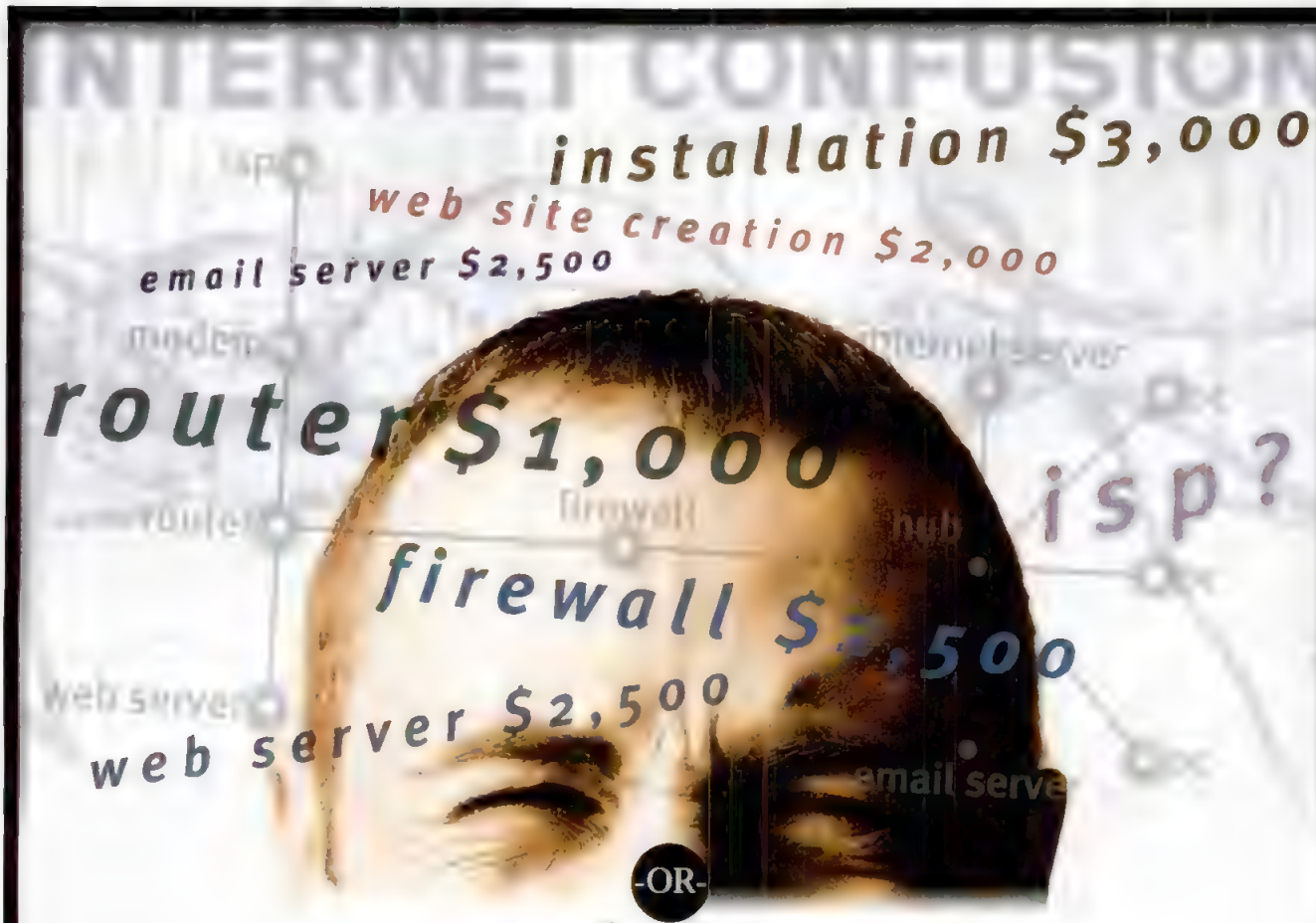
In this sidebar we look at four of the most popular pocket print servers on the market: the Axis PrintPoint 140BJC, the Emulex NETQue Pocket Print Server, the Extended Systems PocketPrintServer 2841C, and the Linksys Pocket Print Server. With the exception of Extended Systems, each of the vendors also offers a multiport solution.

The **Axis PrintPoint 140BJC** ($199 list) is the least expensive product discussed here but has the least functionality. Developed with the help of Canon, the 140BJC has a 10Base-T Ethernet port and works with all of the major networking protocols, including IPX, TCP/IP, NetBEUI, and AppleTalk. Although this proprietary solution includes a built-in Web server that provides you with every detail you need to know about your printer, the 140BJC works only with Canon's BubbleJet printers. (Axis Communications, Woburn, MA; 800-444-2947, 718-938-1188; www.axisinc.com. *Choose 903 at www.pcmag.com/infolink.*)

Except for having only a single parallel port, the $289 **Emulex NETQue Pocket Print Server** provides all of the same functionality as its big brother, the NETQue PRO2. Both run at 10 Mbps, share the same Windows-based management utility, and include all of the network protocols you need. Neither print server has a driver for printing directly over TCP/IP from a Windows 95–based PC, but the vendor offers an optional utility to correct this. Unfortunately, the third-party driver expires after 30 days. By the time you read this, Emulex will bundle this driver with every print server in the product's next release. (Emulex Corp., Costa Mesa, CA; 800-590-5773, 714-662-5600; www.emulex.com. *Choose 905 at www.pcmag.com/infolink.*)

THE EXTENDED SYSTEMS 2841C *can be managed from the Web or a Windows-based utility.*

Extended Systems has been making print servers for a long time. Interestingly, it offers only single-port pocket and internal print server devices. The $349 **Extended Systems PocketPrintServer 2841C,** the company's flagship product, works with all of the major networking protocols. It has a proprietary driver



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THE NETQUE'S *oversize buttons simplify print server monitoring, management, and configuration.*

fering a third-party driver called NIPrint, which is downloadable from the Web site and lets you print over IP under Windows 95. Unfortunately, for some strange reason the software is good for only 20 days. Emulex claims that it will include an unlimited copy of NIPrint in the next release of the NETQue.

The NETQue comes with Windows-based management software that lets you configure the unit and monitor it once it's running. The software is fairly easy to use and provides some interesting statistics on the printer, ports, and network. If your printer has a bidirectional parallel port, you can even view printer-specific information such as a paper jam and printer off-line or out of paper. The lack of browser-based management, however, shows that this product is in need of an update.

Emulex NETQue PRO2. List price: $599. Emulex Corp., Costa Mesa, CA; 800-590-5773, 714-662-5600; fax, 714-513-8266; www.emulex.com. *Choose 905 at www.pcmag.com/infolink.*

HP JetDirect EX Plus3 Print Server

The HP JetDirect EX Plus3 Print Server works with almost every protocol and NOS. It offers excellent Windows- and Web-based management software, and it placed near the top on our performance test. Unfortunately, the product doesn't yet offer a 100-Mbps Ethernet port, and its Web management software required us to use an existing Web server.

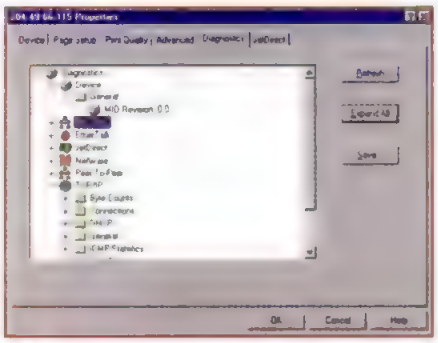
The JetDirect retails for $479; like the EtherFast, it has three parallel ports. The chassis has two LEDs, one for activity and the other for status, plus a test button that prints out the status of the unit in any of several different languages. The unit works with all popular protocols including TCP/IP, IPX, AppleTalk, and DLC. You can print to the server using any NetWare or Windows networking client, as well as with several flavors of Unix and OS/2.

Installation is easy, but the manual is misleading. For example, the manual says that you must use IPX/SPX to communicate with the server from a Windows 95 peer-based client. We found, however, that you can also use TCP/IP.

When you set up the print server, the JetAdmin utility automatically scans for any servers on the network. JetAdmin includes a port driver that lets you communicate directly with the device without first going through a PC-based print server. You can also install the driver on a single Windows 95– or NT–based PC and use the built-in networking of the OS to share the printer with other users. If you want to share printers with NetWare clients, you have to use a NetWare server to hold the queues.

The Windows-based JetAdmin lets you manage all of your JetDirect print servers from a single location. We used it on our tests to configure our print server to handle jobs from Windows 95, Windows NT, and NetWare clients. The statistics you can gather are amazing. We were able to see whether our printers were connected, how many pages they had printed, and even the number of errors and packets running across the TCP/IP connection.

If you want to use the Web to manage your unit, you can download Web JetAdmin for free. The utility we tested requires an existing Web server and proprietary software on the console to run, but it provides the same basic functions



HP'S JETADMIN *utility monitors all of the ports and network protocols installed on the server.*

as the Windows-based version. A new version of this utility that won't need an existing Web server should be out by the time you read this.

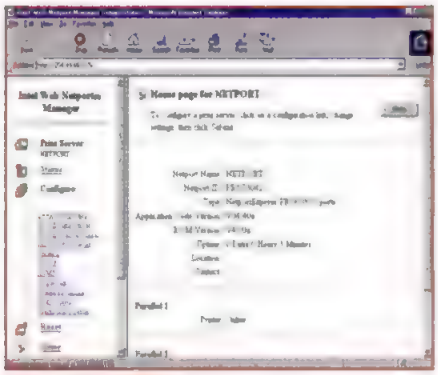
HP JetDirect EX Plus3 Print Server. List price: $479. Hewlett-Packard Co., Palo Alto, CA; 800-333-1917, 208-323-2551; www.hp.com. *Choose 906 at www.pcmag.com/infolink.*

Intel NetportExpress PRO/100

PC MAGAZINE EDITORS' CHOICE

The Intel NetportExpress PRO/100, our Editors' Choice, offers everything you need in a standalone print server, including multiple protocols, excellent Windows- and Web-based management, 10/100-Mbps Ethernet connectivity, and the ability to use all of the popular NOS and client software.

The three-port external NetportExpress model retails for $499. The unit offers two parallel ports, one serial port, and a 10/100-Mbps auto-sensing Ethernet connection. It works with TCP/IP, IPX, NetBEUI, and AppleTalk protocols, and you can use it to share printers on a NetWare-, Windows-, or Unix-based network. The chassis has three status LEDs, one each



USE A WEB BROWSER *to change configuration settings for your NetportExpress print servers.*

for link, transmit, and receive activity. A diagnostic button lets you send a status page to the printer attached to the first parallel port.

The product gives you two options for installation and configuration. You can use the Windows-based Netport Manager to auto-detect any NetportExpress servers and then configure each server, or you can use either a Microsoft or Netscape browser to perform the configuration. To use the Web to install and configure the server, however, you must provide the device with an IP address.

Like the other products in this roundup, the NetportExpress can be configured to emulate a NetWare Pserver or Rprinter device. Once you enable this option using Netport Manager, you can either use Novell's NWAdmin to configure the print server or elect to do everything from within Netport Manager. You can use Port Monitor, a program you install from within Netport Manager, to print directly to the device or share the NetportExpress on a Windows-based network.

Our favorite management feature was the statistics option. The menu lets you gather all kinds of statistics about your printers, network, device, and protocols. You can use the Web and Windows managers to configure different options, reset the server, and monitor

Seagate Software

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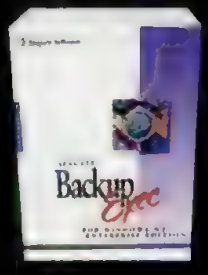

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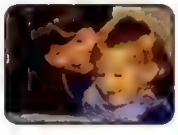

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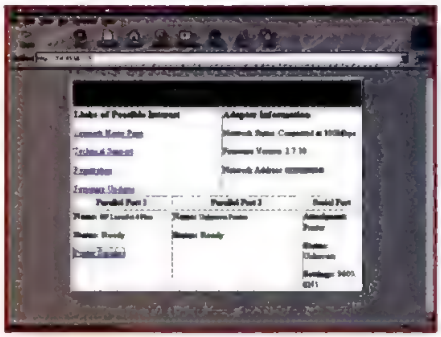
print jobs. If your printer is bidirectional, you can see whether it is off-line, is out of paper, or has a paper jam.

Intel NetportExpress PRO/100. List price: $499. Intel Corp., Santa Clara, CA; 800-548-4725, 408-765-8080; www.intel.com. *Choose 907 at www.pcmag.com/infolink.*

Lexmark MarkNet Pro 3

The Lexmark MarkNet Pro 3 is the only product in this roundup that lets you use the on-board serial port to connect to a fax modem as well as to a printer. This gives you the ability to print incoming faxes. The product works with almost every network protocol. It is extremely flexible and includes a Windows-based management and configuration utility called MarkVision. We did find some problems during the installation, however, and on our performance test, MarkNet came in near the bottom of the pack.

With a list price of $409, the MarkNet is one of the least expensive products in this roundup. The unit has two parallel ports, a serial port, and an auto-sensing 10/100-Mbps Ethernet port. You can also purchase it with a 4/16-Mbps Token-Ring adapter. The chassis has an LED for each printer and a test button that you can use to print out the server's configuration. The MarkNet works with most popular protocols, including TCP/IP, IPX, AppleTalk, and DLC.



THE MARKVISION *utility provides the printer name, type, and network information.*

The MarkNet has both a manual and on-line documentation, but we didn't like the way the information was organized. For example, to print to the device using Windows 95 or Windows NT, you must either give it an IP address or have the MarkNet get its IP address from a DHCP server on the network. This step is hidden in the online documentation, and we needed over an hour to find it. We finally had to call technical support to get the unit fully installed.

The MarkNet's ability to use the serial port to print incoming faxes makes it unique in this roundup. You can attach almost any fax modem to the serial port on the server, connect a phone line, and start receiving faxes. By default, the server prints to its first parallel port, or you can configure it to print faxes to another port. If the printer is busy, you can set it up to try another printer or ignore the incoming call. Faxes are converted to a Post-

BENCHMARK TESTS

Print Servers

PC MAGAZINE LABS

Our tests of eight print servers show that shared network connections can be as fast as parallel cable connections. The speed of the network is not a factor, but the size of the print server's memory buffer makes a difference.

What the Numbers Mean

The numbers on the right show the elapsed time for a print job. Unless your print jobs are as large as our test job—10MB or more—you won't see a performance difference between printing to a printer attached directly to your computer's parallel port and using a networked print server. The speed of the printers and the need to queue jobs from multiple users constitute a bigger practical bottleneck than the data-handling actions of the print server. We also found that the speed of the Ethernet port doesn't make a big difference in terms of performance. For example, the Linksys EtherFast 3-Port 10/100, which garnered the best score, has a 100-Mbps connection, but so does the Intel NetportExpress PRO/100, which came in near the end. The major difference between the products has more to do with the size of the internal buffer. The EtherFast has a 128K buffer, while the NetportExpress has only about 30K of buffer space per port.

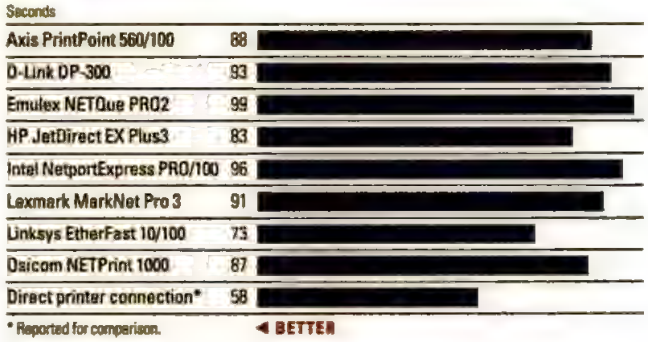
The overall percentage difference in performance between the products was small. We recommend that you concentrate on the price, the protocols, and the management features of the print server when making a buying decision.—*Analysis written by Steve Rigney*

How We Tested

Our goal was to see how long it took each print server to receive a job from the client PC and then despool the pages to the printer. Our test-bed included both NetWare and Windows NT servers, three Compaq Deskpro 2000 client PCs running Windows 95, three HP LaserJet 4M Plus printers, and the print servers. All Ethernet devices were connected to a Netgear SW507 Ethernet Switch. The SW507 has six 10-Mbps switched ports and one 100-Mbps port. With the exception of the Emulex, Intel, and Osicom units, which have only 10-Mbps connections, we connected each of the print servers to the 100-Mbps port on the switch. Print jobs were submitted over IP using the Lpr/Lpd utility if possible. The Axis and D-Link servers required the use of NetBEUI.

We needed a job that was big enough to provide a measurable difference. We used Microsoft Word 97 to create a number of jobs, sent each one to the printer, and timed the results. It was not until our print job was approximately 10MB—a two-page document with large bitmaps—that we saw a noticeable difference between printing to a locally attached printer and going through a network print server. The results of using the 10MB print job are shown here.

10MB Microsoft Word File



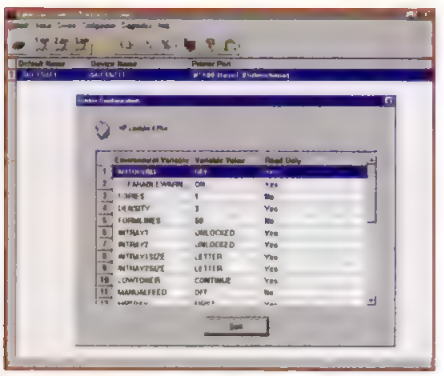
Script format, so the printer must support PostScript Level 2.

We found the Windows-based management utility MarkVision easy to use. MarkVision aids configuration and provides statistics on the unit; it can also set up alerts and keep a log file to track errors. The Web-based management is very basic; it shows you only whether the print server is up and what firmware revision it is running. Lexmark has a Java applet that offers more printer information, but that works only with specific Lexmark printers.

Lexmark MarkNet Pro 3. List price: $409. Lexmark International Inc., Lexington, KY; 800-539-6275, 606-232-2000; fax, 606-232-5939; www.lexmark.com. *Choose 908 at www.pcmag.com/infolink.*

Linksys EtherFast 3-Port 10/100 Print Server

Linksys focuses on providing practical products for the SOHO and small-business market. The Linksys EtherFast 3-Port 10/100 Print Server ($349 list) works only with TCP/IP and IPX and only in certain configurations. It comes with minimal documentation and lacks Web-based management software. The EtherFast performed well on our tests, however, and was easy to install. It also has three parallel ports and an auto-sensing 10/100-Mbps Ethernet port. In sum, if your needs are fairly basic, the EtherFast should serve you well.



LINKSYS'S ADMIN *provides detailed information on printer warnings and statistics.*

The desktop modem–size EtherFast includes three bidirectional parallel ports and the ability to sense between full- and half-duplex 10/100-Mbps Ethernet connections. But with only two LEDs, one for link and the other for errors, the unit doesn't provide much status information.

Installation is easy. Before you begin, you must decide what type of print server you want the EtherFast to emulate. You can configure the unit to serve as a NetWare Pserver and Rprinter or to use proprietary drivers to print from any Windows 95– or Windows NT–based PC. The unit works only with TCP/IP if you're running Windows NT or 95 and with IPX if you're running NetWare.

Before you can use TCP/IP, the installation utility must specify an IP address for the server; the only information you need to provide is the number on the bottom of the unit. To print using TCP/IP, you must install the Linksys PrintServer driver on all of your clients. This redirector lets you print directly to the print server without going through a server's queue. If installing client software seems like a lot of work, you can install the software on a Windows 95 or Windows NT server and share the printer across the network. For NetWare printing, you can use the NetWare utilities NWAdmin and Pconsole to setup the print server.

The Windows-based Admin utility lets you manage multiple EtherFast servers from a single PC. You can use it to reset the servers and monitor individual ports, as well as to change the TCP/IP and IPX information on the unit. We used the software to send test pages to all of our printers to make sure that they were working properly. Although the Admin utility doesn't offer neat graphics or a picture of our unit, it performed all of the tasks we required.

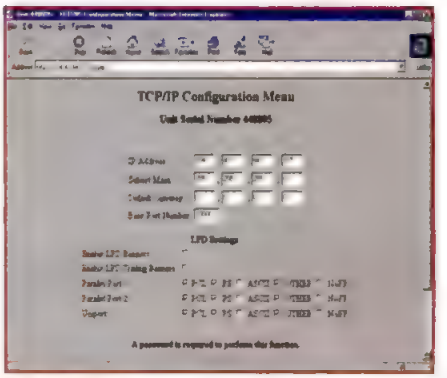
Linksys EtherFast 3-Port 10/100 Print Server. List price: $349. Linksys, Irvine, CA; 800-546-5797, 714-261-1288; fax, 714-261-8868; www.linksys.com. *Choose 909 at www.pcmag.com/link.*

Osicom NETPrint 1000

If you need to share a printer on a VINES network, then the Osicom NETPrint 1000 is probably your best solution. Designed primarily for NetWare- and VINES-based networks, the NETPrint also works with Windows NT and 95. The unit is very easy to configure using the supplied software or a Web browser. If it hadn't taken us 2 hours to find the management software password, we could have installed the product within seconds of opening the box. On our tests, the product's performance was middling.

The NETPrint has a list price of $649, making it the most expensive product in this roundup. This elevated price tag is due mainly to the product's VINES support. The unit is also one of smallest in the roundup and, like the Intel server, uses a brick-style AC adapter. The box has only one LED to show whether it is functioning correctly. Two parallel ports and one serial port let you connect up to three printers. The NETPrint can handle print jobs running over TCP/IP, IPX, and AppleTalk. Although the unit currently works only with 10-Mbps Ethernet, it comes with both 10Base-T and 10Base2 connectors.

The NETPrint offers two different methods of installation. You can use the bundled NSBrowse utility to find the server and configure all of the settings using its Web-like interface. NSBrowse uses the IPX protocol to sniff out your NETPrint devices and thus works only if you have an existing NetWare



THE NETPRINT *utility allows only certain print jobs to run over particular protocols.*

server. If you don't have one, you can use TCP/IP and any browser to configure the device. Before you use your browser, you must use the ARP command to specify an IP address for the server. Overall, the product is extremely straightforward and easy to install. The only problem we had was finding the default password. After searching the online documentation for 2 hours, we finally called the vendor for help.

Both setup methods afford the same functionality. You can use this utility to configure your NetWare and VINES print servers, set up your protocol information, and view basic status. You can also reset a device and enable a protocol to accept only certain job types, such as PCL or PostScript. The only function we found lacking was information about the status of the ports and printers. We were unable to see if the printer was off line or out of paper, and we were unable to determine how many jobs or how much traffic had passed through a particular port. Osicom plans to add most of these features in the next release.

Osicom NETPrint 1000. List price: $649. Osicom Digital Products, Waltham, MA; 800-243-2333, 781-647-1234; fax, 781-647-4474; www.digprod.com. *Choose 910 at www.pcmag.com/infolink.* PC

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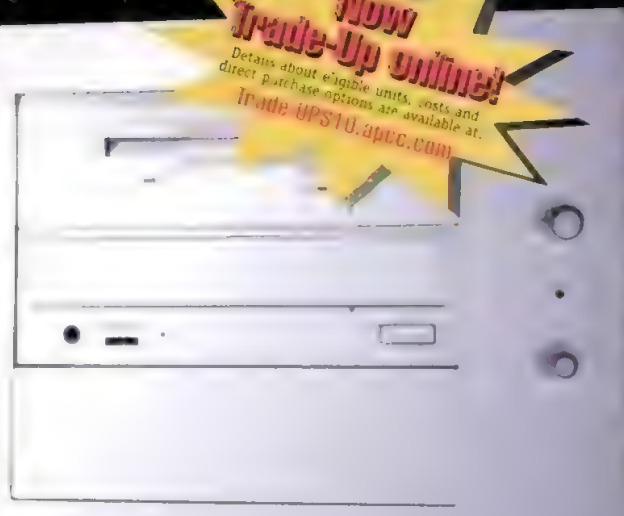

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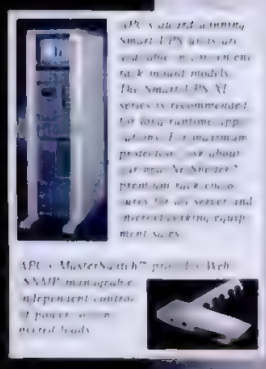

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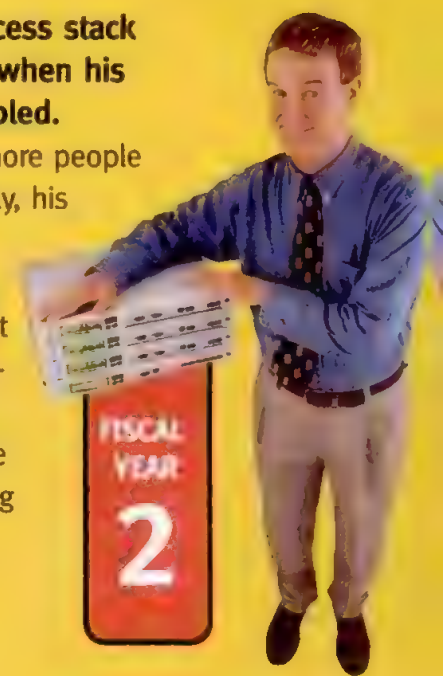

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*Ratio of 5 users to every 1 port
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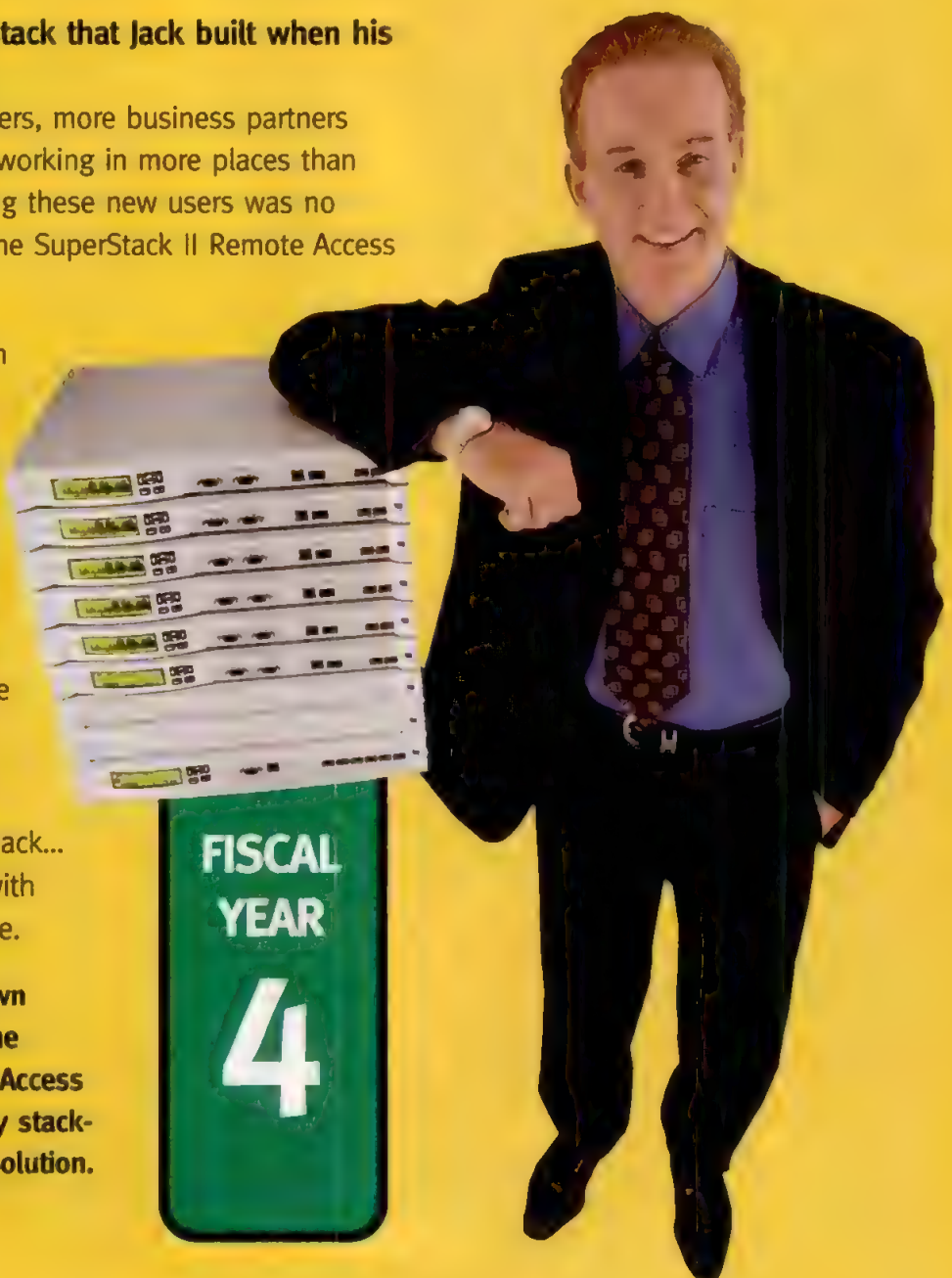

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Net Tools

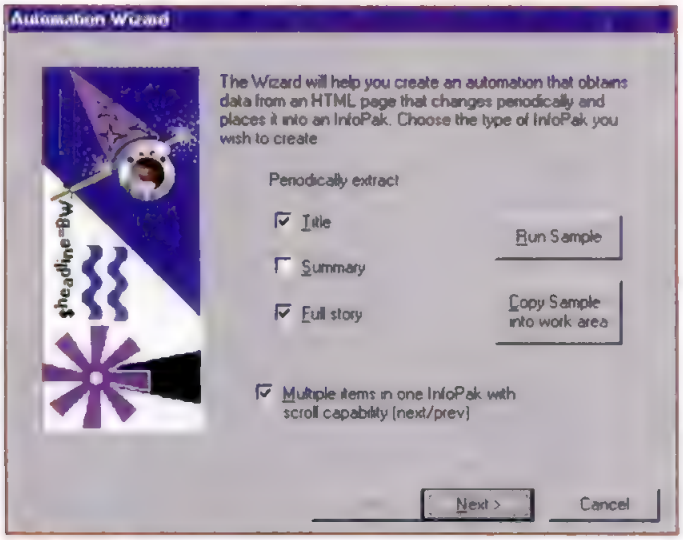
FROM THE BENCH

PUSH SERVERS

BackWeb Pushes Back

By Les Freed

When we last reviewed BackWeb ("The Intranet Channel," June 10, 1997), we concluded that e-mail was still a better information delivery system for most organizations. BackWeb Server 3.0 contains new features, such as InfoPak and client authoring tools, that make it more useful as a content delivery tool for local network users as well as road warriors, but we're still awestruck by its $10,500 price tag.



BACK MAGIC: *New wizards let users publish their new content in InfoPaks.*

BackWeb was one of the first push server products on the market. Like PointCast, BackWeb's client freeware lets BackWeb users receive subscription-based inventory, marketing, and sales information in the background while carrying on normal network traffic. To distribute your own BackWeb content over the Internet or your corporate intranet, you will need the BackWeb Server, which includes the server software, content development tools, and client deployment and management tools that let you create your own custom BackWeb clients.

The product distributes four content types—flashes, screen savers, wallpapers, and audio messages—called InfoPaks. The most common, the flash, pops up animated messages on the user's screen. BackWeb's screen saver and wallpaper options replace clients' standard screen savers or wallpapers. BackWeb can also be used to distribute any type of file to client machines.

The original BackWeb Server was based on a one-to-many model. A major change in BackWeb is the introduction of Publishing Wizard, a Web-based tool that lets authorized users with custom clients "push back" content, which can then be published by the server.

To use the Publishing Wizard, we pointed our browser to our BackWeb Server's IP address. A simple, fill-in-the-blanks interface guided us through the process of creating a new InfoPak. We had a choice of 40 templates as starting points for our content. An additional BackWeb tool automatically grabs content from a Web page and republishes it as a flash.

Another new feature is the BackWeb Administration Kit. It let us create custom BackWeb client packages for subsequent redistribution. We were able to add custom logos, create a list of presubscribed BackWeb channels, set all the BackWeb client software options, and build custom BackWeb installer programs. The customized client makes installation easier, because users don't need to perform any configuration task.

BackWeb has always been miserly with bandwidth. Its Polite Agent technology makes sure that BackWeb won't hog network bandwidth, and the latest version supports IP multicasting. An optional caching proxy server stores frequently hit BackWeb content, further diminishing Internet traffic.

BackWeb remains easy to install and operate. The server portion runs only on Windows NT and Solaris, but the remaining components—including server console and authoring tools—also run on Windows 95. They can create content and control the server from any network desktop.

BackWeb Server 3.0. List price: $10,500. BackWeb Technologies Inc., Santa Clara, CA; 408-437-0200; www.backweb.com. *Choose 900 at www.pcmag.com/infolink.*

NETWORK BACKUP

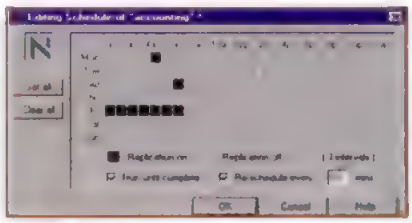
Backup on the Fly

By Steve Rigney

If your medium-size or large company needs access to its data around the clock and cannot afford to shut down its servers even for a routine tape backup, then Network Integrity's Real-Time Replicator for NT is worth a look. As its name suggests, Real-Time lets you copy your important data in real time, or at scheduled intervals, to multiple Windows NT–based servers on your TCP/IP network. The product also features many-to-one backup, bandwidth management, and easy installation. Our only serious complaint is that setup requires the use of DNS host names instead of simple IP addresses.

Real-Time is more expensive than your normal software and tape-drive backup solution. A single version of the product retails for $1,995, and you need a license for every server you plan to protect. Your minimum investment will be two licenses—one for the source server and one for the target server. The product consists of the source- and target-server software along with the Real-Time Administrator. Each Windows NT server can work as a target server and a source server simultaneously, but a single server can't be a source and target server for itself. In addition, a target server can store data from multiple source servers.

We found the product was fairly easy to install. Real-Time uses TCP/IP to communicate between the servers. It also requires DNS names; you can't use IP addresses to specify different servers. Because we didn't have a DNS server on our test network, we needed



ADDED SAVINGS: *You can schedule Real-Time replications to save bandwidth.*

CROSS TALK

Leon, in this market, new technologies, such as push technology, don't eliminate older technologies like e-mail; they just take some of the market share. Push products, such as BackWeb and PointCast, have peaked in their popularity, but they still have significant markets.

Push technology has some great niches, Frank. It's great for delivering timely sales, product, and inventory information across your intranet. It's also useful for specialized subscription services. And at these prices, companies will need good cost justification to install BackWeb.

Net Tools FROM THE BENCH

to create host files on each server. This isn't a difficult task if you have a small number of servers, but we'd prefer the product to work with IP addresses as well as DNS names.

Once we had Real-Time installed on two servers, we were ready to start replicating data. The first step was to determine which PC would be the source and which would be the target. The only rule about assigning target servers is that they must have enough space to hold all the replicated data.

Next, we created a replication policy to determine which data we wanted replicated and when it should be done. We had a choice of dynamic or synchronized replication. Dynamic replication runs in real time and copies the data as soon as changes are made. Synchronized replication lets you schedule when the data should be copied to the target server. Of the two, dynamic replication lets users access more up-to-date data but requires more bandwidth.

Real-Time provides two methods of cutting down the level of network traffic it generates. Using what is called byte- or file-level copying, the product monitors all of the writes made on the source server and replicates only the new changes to the files. For example, if you add a single record to a Lotus Notes, Microsoft Exchange, or Oracle database, Real-Time will copy only that new record instead of the entire database.

You can also define the amount of bandwidth that Real-Time uses during replication. On our tests, we configured the unit to use 50 percent of our 100-Mbps Ethernet network. The product will work over any IP network using almost any dial-up, LAN, or WAN connection.

Another handy feature of Real-Time lets you pause a replication, move the replicated data to a new directory, start a backup using any software, and resume the replication process. This guarantees that you are always replicating in real time, but in addition, it also provides one more layer of tape protection.

Real-Time Replicator for NT. List price: Single server license, $1,995. Network Integrity, West Marlborough, MA; 800-638-5518, 508-460-6670; fax, 508-460-6771; www.netint.com. *Choose 901 at www.pcmag.com/infolink.*

MULTIPLEACCESS

Bits and Pieces

By Steve Buehler

Remember that Dave Clark Five hit "Bits and Pieces"? Well, your hard disk is playing that song over and over and may eventually suffer a performance hit because of it. Your server's hard disk files get fragmented with the data you write, and over time your disk can spend many microseconds finding all the bits and pieces needed to present you with a complete file.

In the old days, servers—such as my HP 3000—had no defragmentation tools. Recovering lost disk space meant unloading the entire file system to tape and reloading in order to lay out contiguous files. This monthly task could take up to a whole day to finish. PC software vendors such as Peter Norton did a great job at giving users sophisticated tools for defragmenting disks, and some users went overboard and cleaned up their hard disks every day. Microsoft added basic defragmentation right into the Windows Plus! pack, which now makes it easy to keep your hard disk tidy.

Much of corporate America, however, has stayed away from Windows 95. With the widespread acceptance of Windows NT—both server and desktop—in business, two companies have taken the opportunity to offer Windows NT defraggers, and both have interesting approaches. The bigger player in this market is Executive Software's Diskeeper (*www.execsoft.com*). Diskeeper comes in versions for Windows NT Server ($399 list) and Windows NT Workstation ($75 list), as well as a new, free Lite version, which doesn't have the automatic features of the standard version. Microsoft plans on bundling the Lite version with Windows NT 5.0, filling a gap in the original product's feature set.

The program also has a Network Optimization feature that lets network administrators defragment users' machines remotely. This is indeed a neat touch for remote management.

The other player in this market is PerfectDisk NT, from Raxco (*www.raxco.com*), with aggressive introductory prices of $199 per server (regularly $399 list) and $49 per desktop (regularly $99 list). PerfectDisk does standard defragmentation, but it has a unique optimization feature. The program watches you work and notes which files you access most often. It will move those files near to Windows NT's Master File Table, which is one of the hot spots for access on the disk. This minimizes the disk-head movement between reading the information about a file and the file itself, resulting in shorter seek times and faster transfers. PerfectDisk NT is quite tunable, letting you schedule its operation—to defragment and move only often-used files, and to allocate the resources it can use.

Is disk defragmentation under Windows NT, or any file system, a necessity? No. Your system will run just fine without it, but your hard disk throughput will slow down over time. By using a defragger, you can change your hard disk's tune from "Bits and Pieces" into another Dave Clark Five hit—"Glad All Over"—without missing a beat.

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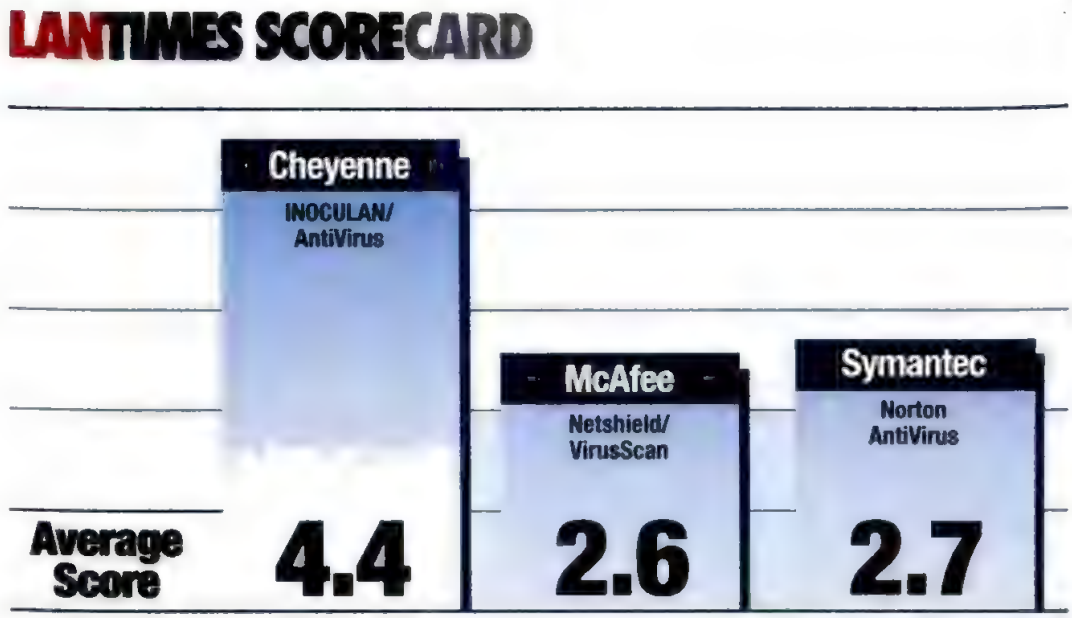

Source: LAN Times July 21, 1997.
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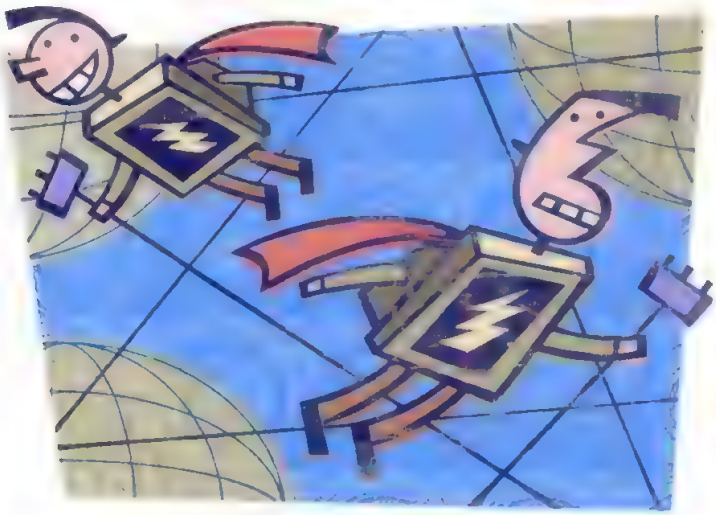


By Les Freed

A few years ago, in a book about the then-trendy "information highway," senior networking editor Frank J. Derfler, Jr., and I postulated that the Internet might be replaced by a faster, more reliable network with multimegabit connections for everyone. We got the "replaced" part wrong, but we were right on the money with our multimegabit prediction.

The next great leap forward in Internet access technology will bring multimegabit transfer speeds to your desktop, where two vastly different technologies—cable modems and xDSL—are vying for the hearts and wallets of Web surfers. Both offer always-on, no-dialing-required, fasten-your-seat-belt Internet access on your PC. And both technologies breathe new life—and new revenue—into existing networks, although proponents of each technology view the other technology as the enemy.

Cable modems are provided by local cable companies, often in conjunction with national backbone provider networks such as @Home. Local telephone companies offer xDSL services, but other specialized carriers may emerge specifically to serve xDSL customers.

CABLE MODEMS

Cable modems provide fast Internet access over cable TV networks. This type of modem is used primarily for home Internet access, since most residential areas (unlike office buildings and business parks) are wired for cable.

The devices, manufactured by such vendors as Bay Networks and Motorola, typically are external boxes that attach to client PCs via Ethernet interfaces. But we expect to see USB and FireWire cable modems in the next few months. In most cases, a cable modem user is assigned a single IP address, but many cable modem providers offer additional IP addresses for multiple computers at a nominal additional charge. Users with multiple home PCs can sidestep the single–IP address problem by installing a proxy server. This lets several PCs share a single IP address, though some cable providers prohibit the use of proxy servers.

There are two dramatically different classes of cable modems: hybrid fiber-coax (HFC) modems, which are two-way devices that operate over HFC cable serving 10 million U.S. homes, and older one-way modems that operate over traditional coaxial TV cables, currently serving more than 50 million homes. HFC modems typically offer download speeds in the 3- to 30-Mbps range, with upload speeds ranging from 128 Kbps to 10 Mbps, though users currently can expect speeds around 4 Mbps. One-way coaxial cable modems offer download speeds of up to 2 Mbps; such a modem requires a dial-up conventional modem to complete a connection.

Although conventional one-way cable serves more U.S. homes than HFC, much of it is at or near the end of its service life, and virtually all new cable construction is HFC. Regardless, any cable modem uses one or two 6-MHz TV channels. Because the cable industry's network has a bus topology, every cable modem in a neighborhood shares access to a single coaxial cable backbone. Sharing can slow throughput, but this hasn't been reported as a problem yet, and it can be avoided by good design. Similarly, MAC-layer filtering on each connection eliminates the potential for eavesdropping. A cable router in each neighborhood combines the local data traffic and communicates with a larger router at the cable company's main plant via the fiber-optic part of the HFC backbone cable.

Since a local cable company typically provides the modem as part of its service, interoperability between modems really doesn't matter much. But because this will become more important in the next couple of years, when you will be able to buy and own your

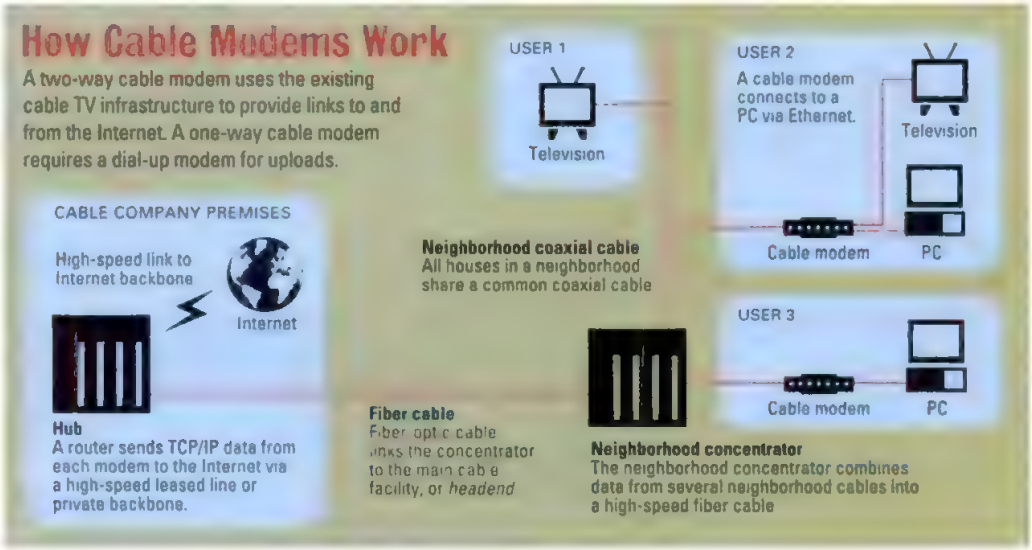


ILLUSTRATION BY MARK SHAVER

own cable modem, vendors are working on a unified standard.

xDSL

xDSL is a catchall name for a variety of DSL (digital subscriber line) technologies developed in the 1980s to offer phone companies a way into the cable TV business, by delivering video-on-demand over regular phone lines. Though xDSL predates cable modem service by a couple of years, deployment has been mostly limited to field trials. The technology lacks industry-wide standards.

DSL technologies are very fast, offering download speeds up to 32 Mbps and upload speeds ranging from 32 Kbps to over 1 Mbps, which may prove a godsend for companies seeking to deliver high-speed Internet access to remote users. Both ADSL (asymmetric DSL) and RADSL (rate-adaptive DSL) operate faster in one direction than in the other. Both can potentially provide downlink speeds up to 8 Mbps and uplink speeds up to 1 Mbps. Additionally, both ADSL and DSL operate over existing voice-grade telephone circuits without disturbing the existing telephone connections. RADSL can be throttled back to operate at lower speeds on lines that can't provide full-speed DSL connections.

HDSL (high-bit-rate DSL) is a similar technology that provides T1-equivalent speeds (1,544 Mbps) over dedicated voice-grade phone lines. Like T1, HDSL is symmetrical, providing the same connection speed in both directions.

xDSL has several similarities to ISDN. Both technologies require that copper phone lines be electrically "clean," and both can operate only on lines that have relatively short runs (typically less than 20,000 wire feet) to the phone company's central office. Because xDSL is telephone-based, it's more likely than cable to be available in business-only areas. In very high-density urban areas, the majority of offices will be within xDSL's cable-length limits, although some big-city phone wiring isn't clean enough for widespread deployment.

xDSL provides an opportunity for the newly formed competitive local exchange carriers to snare big customers.

In most cases, xDSL can operate over existing voice-grade, twisted-pair phone cables without disturbing the existing POTS (plain old telephone service) connection—meaning that local phone companies won't have to run additional lines to provide xDSL service.

To date, very few phone companies have actually stepped up to the plate to offer xDSL services. Last November, GTE began offering limited commercial xDSL service in San Diego, and the company has announced plans to roll out service in Indiana, North Carolina, Texas, and Washington early this year.

Some phone companies are planning to offer point-to-point xDSL service, much as they currently offer T1 and T3 leased-line services. Technically savvy companies can even create their own xDSL WANs by leasing lines from a local phone company and attaching their own xDSL equipment. xDSL provides an opportunity for the newly formed competitive local exchange carriers (CLECs) to snare big customers by offering a service that the traditional phone companies don't offer yet.

Expect xDSL services to become more prevalent as the ITU standards committees finalize two national and worldwide standards for xDSL. G.dmt is based on existing ADSL specifications and will provide 6.144 Mbps downstream and 640 Kbps upstream. Like RADSL, G.dmt will permit rate adaptation for less-than-optimal lines. But it's G.lite that has everyone excited. With downstream speeds of 500 Kbps to 1 Mbps and upstream channels from 100 to 200 Kbps, G.lite isn't as speedy as G.dmt, but it offers the ability to operate over longer distances—beyond 18,000 feet.

MORE ALIKE THAN DIFFERENT

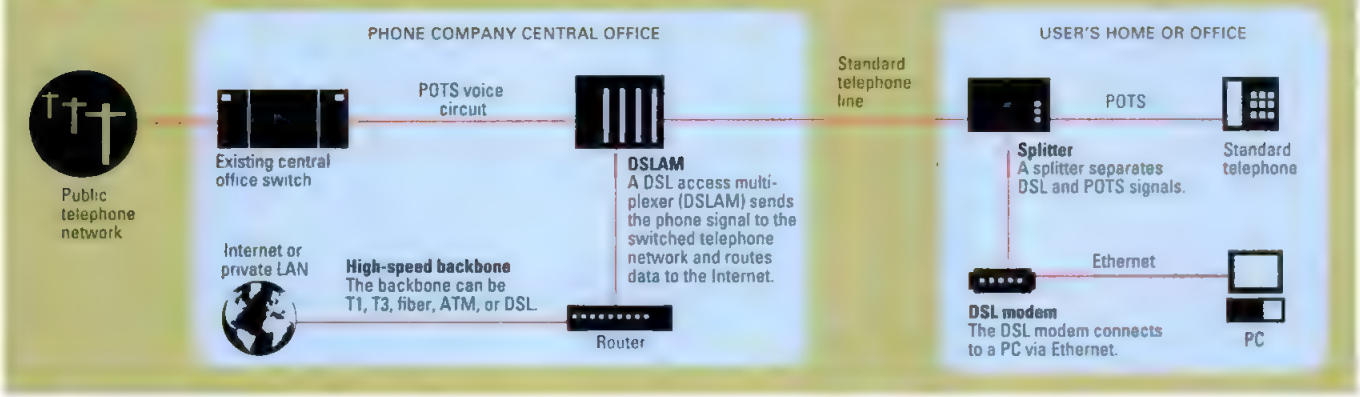
Though the underlying technologies are radically different, there are some striking similarities between cable modems and xDSL. Both offer speeds well above any conventional modem available today, and it's possible to use either one for remote LAN access as well. New IP tunneling technologies such as PPTP provide secure paths for IP and IPX network data over the public Internet.

The two technologies also share the problem of connecting hundreds or thousands of multimegabit users to the Internet without creating an additional bottleneck. The cable industry's @Home network features a private 155-Mbps fiber-optic ATM backbone that bypasses much of the Internet and provides fast connections to its member companies. How the local phone companies intend to deal with the bandwidth crunch is not clear, but they will likely have to add backbone network capacity between their central offices to handle the additional traffic generated by xDSL Internet users.

Choosing between the two may come down to price. Most cable modem subscriptions—including Internet access and modem rental—cost $40 to $50 per month, with a $100 to $200 installation charge. GTE's San Diego xDSL offering is priced at $125 monthly, plus $250 for installation, but prices probably will vary widely. PC

How xDSL Works

Telephone companies use digital subscriber lines to deliver high-speed data over preexisting copper telephone lines.



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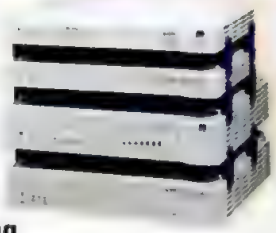

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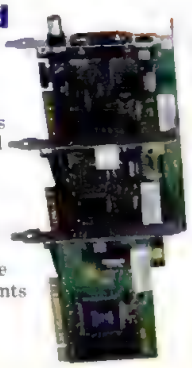

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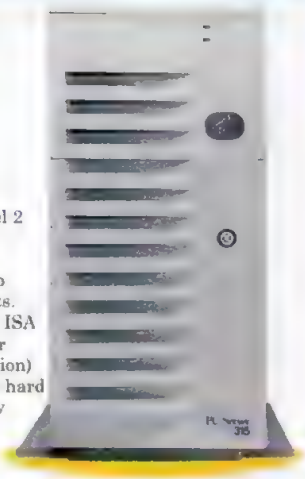

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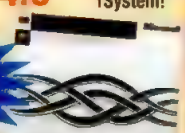

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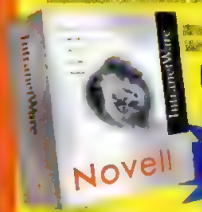

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DEH2553 Baystack 350F 14 Port 10/100	$3099.[illegible]
DEH2526 Netgear SW510 10 Port	$679.[illegible]
DEH2524 Netgear SW518 18 Port	$1085.[illegible]
DEH2095 Allied Telesyn 16 Port	$899.95
DEH2619 Cisco Catalyst 2100 25 port	$999.00
DEH2458 Cisco Catalyst 1900	$1499.[illegible]
DEH2140 HP AdvanceStack 24 Port	$819.95
DEH[illegible] Baystack 303 24 Port	$129[illegible]

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DEB[illegible] NetGear RT328 ISDN Router	$3[illegible]
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DEB1609 Cisco 2514 2Enet. Dual Serial Router	$2139.99
DEB1391 Ascend Pipeline 75Ui ISDN Router w/ 2 Analog	$[illegible]
DMD1286 Ascend Pipeline 50Ui ISDN Router	$[illegible]
DEB1168 Ascend Pipeline 130 T1 2St ISDN BRI	$1359
DEB1652 Web Ramp M3 3-Port Analog Router	$329.[illegible]
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Diagnose and Repair Your Web Site

You expend a lot of effort creating the perfect Web site. Shouldn't you make sure it actually works?

By Neil Randall

Web sites are dynamic. At least they should be. They should change regularly and routinely. Pages and sets of pages should be added as the need arises, and links to internal documents, external sites, databases, and graphics and multimedia files should be kept up to date to complement new content. The last thing you want to do, after all, is lead your visitors down a dead-end street; every link they click on must lead to a destination. Otherwise your visitors will lose respect for your site and confidence in your capabilities. You wouldn't send out a year-end report with missing pages or references to nonexistent charts, and you shouldn't mount a Web site that isn't technically sound.

A dysfunctional Web site can do as much harm to your corporate ethos as a misdirected magazine ad or a lousy salesperson. *Ethos*—the term comes from Aristotle and still dominates studies of communication—is a combination of image, character, and credibility, exactly the combination you need to keep your business foremost in the minds of your customers or your potential customers. If your site has careless errors—even little ones, like spelling mistakes—your ethos suffers, because your visitors see you as less credible. Add a few badly chosen bits of humor to the mix, and project a sense that your site is all sizzle and no steak, and things slide even further. But quite possibly nothing destroys ethos as much as links that don't go anywhere, images that can't be located, and forms that don't work. One of these problems is bad enough; more than one

INSIDE

▼TUTOR: DirectX gives game and multimedia developers a way to build access to hardware devices, such as video and sound components, directly into their programs. *Page 249.*

OPERATING SYSTEMS: The Windows Scripting Host was never heralded the way other Windows components were, but this long-awaited replacement for DOS batch files is versatile and powerful. *Page 253.*

UTILITIES: InOutBd uses PCs and a TCP/IP network to put your office's in/out board on the desk of every employee in the company. *Page 257.*

PC SOLUTIONS: Recording sound from audio CDs to your hard disk; using a different alignment character for Corel WordPerfect 7.0 tabs; excluding hidden cells when copying Excel spreadsheets; and much more. *Page 275.*

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and you can kiss your visitors goodbye.

Knowing the pitfalls is one thing; avoiding them is another. In the old days of Web design (until about 1994), you simply mounted your site on a server, clicked on all the links to make sure they led to the right place, and used your text editor to make any necessary changes. Sites back then weren't nearly as complex as they are now, because most were developed by people who had a limited number of items to display and full-time jobs that had nothing to do with the Web. So performing a full Web diagnosis was relatively easy. Normally all the graphics were in one directory, all the HTML files in another, all the CGI scripts in a third. If something didn't work, tracking the problem wasn't hard. But today's Web sites contain hundreds, even thousands, of files, and different teams of people add to and alter their particular areas every day. Documents are edited, files are inserted, scripts are implemented, links are added. There's no way to manage and check the changes without help.

Fortunately, help is available, in the form of Web diagnostic software. In this article we'll look primarily at standalone commercial packages: Astra SiteManager 1.0, from Mercury Interactive Corp. (*www.merc-int.com*); Coast WebMaster 2.0, from Coast Software (*www.coast.com*); and WebAnalyzer 2.0, from InContext Systems (*www.incontest.ca*). We'll also take a brief look at some shareware packages that handle portions of the site management task (see the sidebar "Shareware Link Checkers").

Shareware Link Checkers

The three Web diagnostic packages examined in this article have one downside in common: They're somewhat expensive. If you'd like to try a less pricey solution, check out these shareware offerings, which perform many of the same tasks.

BiggByte Software

InfoLink Link Checker

As its name suggests, BiggByte Software's InfoLink Link Checker 1.9 verifies links into and out of a Web site. Although its appearance doesn't come up to the standards set by the commercial packages reviewed in this article, InfoLink is a fast and capable verifier with a reporting system that makes very clear the status of any individual link. The main window acts as rudimentary browser, but that's not the important part of this package. That honor goes to the Verification Preferences dialog, which lets you filter the types of links you want to see. The dialog even includes a slider labeled *Netiquette;* higher degrees of Netiquette indicate a greater willingness on a user's part to sacrifice download times in favor of freeing the remote server as often as possible for it to handle duties for other visitors. You can specify user names and passwords for specific sites, and you can set anonymous FTP information as well. InfoLink provides a special check for pages with frames and a means of skipping specified URLs during a verification.

InfoLink Link Checker 1.9. List price: $49. BiggByte Software, Fort Smith, AR; www.biggbyte.com. *Choose 553 at www.pcmag.com/infolink.*

TetraNet Software Inc.

LinkBot Pro

Given its hefty price tag, you might wonder how TetraNet Software's LinkBot Pro 3.5 qualifies as shareware. The answer is that's the way it's distributed. But make no mistake about it, LinkBot Pro is a full-featured package. It loads sites quickly through by establishing multiple HTTP connections simultaneously, and it publishes a report in the form of an HTML table as soon as it completes the site download. The report shows the number of successful and unsuccessful connections per protocol (HTTP, FTP, Mailto, and so forth), plus the number of internal, external, and orphaned sites. LinkBot Pro also records the number of slow pages, those that take longer than you specify to download at a connection speed of your choice, and the number of old and new pages, again according to user specifications.

Like its commercial counterparts, LinkBot Pro offers several views of a site. At the left is the URL Tree, which can be filtered to show only broken, slow, or old links (among others), and even pages missing titles. In the main window you can opt for a list of children (the default) or parents of the selected file, you can view HTML source code for that file, you can examine the file's properties, or you can browse to that file, with the window becoming a strong Web browser. Configurable options are numerous, allowing you to display only the information you need. The only thing missing is a graphical display of the site, but for some users that won't be a loss at all. More of a loss is the omission of dynamic checking through user-specified data sets.

LinkBot Pro 3.5. List price: $249.95. TetraNet Software Inc., Ottawa, Ontario, Canada; 613-234-2586; fax, 613-234-2529; www.tetranetsoftware.com. *Choose 554 at www.pcmag.com/infolink.*

RedHog Software

SiteHog

As with InfoLink Link Checker, the strength of RedHog Software's SiteHog 1.0 lies in its configurable options. The windowing display of sites (you can have a different one in each window) is attractive, with unique icons for each type of file in the site, but the ability to filter through the site is what will tempt you into paying the $80 registration fee. Only by registering do you get the ability to access sites via HTTP, so unless you have no need to check remote sites or external links, you don't have much choice but to pay. As for the options, they include the ability to report the compatibility of the site's pages with any version of Netscape Navigator or Microsoft Internet Explorer, beginning with Version 1.0 of each; reporting on pages that defy specific HTML standards (versions 1.0 through 3.2); and reporting on pages that include proprietary HTML extensions for Navigator 1.1, 2.0, and 3.0 or Internet Explorer 2 or 3. You can see if your pages take too long to load at transfer rates ranging from 9,600 bps through ISDN speeds, and you can see HTML errors as well.

SiteHog 1.0. List price: $80. RedHog Software, New Milton, England; www.cix.co.uk/~allied-display/redhog. *Choose 555 at www.pcmag.com/infolink.*

For reasons of space, we won't cover in this article the large Web suites that include such capabilities among their many other features.

WHAT THEY DO

The primary function of Web diagnostic software is to check the validity of hyperlinks in your Web site. To be useful, the software must test both internal links—those that link to pages within your site—and external links—those that link to files at a remote site. All links that could potentially generate error messages must be validated and reported on, with the purpose of informing the Web site maintainer of any problems.

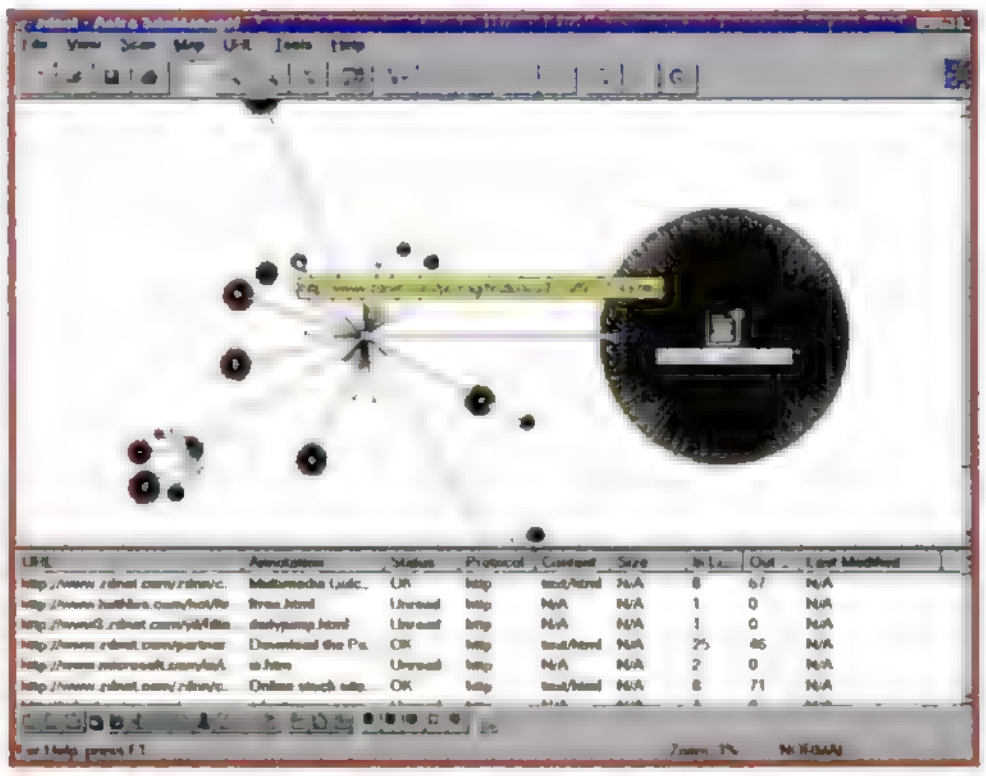

FIGURE 1: *Astra SiteManager displays the ZDNet Web site as a series of linked hubs and spokes, with details in the Textual Display at the bottom of the screen.*

Testing a link is a matter of executing a portion of the HTTP procedure. The diagnostic software emulates the mouse click on the URL, initiating the connection and the request to the server. But as soon as the software verifies that the requested resource is on the server, the process is canceled, as though the user had clicked on the *Stop* button. The link to the server is thus confirmed without the need for downloading any actual files. WebAnalyzer offers an option for site download, but using it is rarely necessary.

More is involved in good Web diagnostic software than simply testing links, however. The software must display the geography of the site in a meaningful way, presenting you with a clear view of any problems. To this end, all three standalone packages offer a visual representation of the site. Astra SiteManager uses a hubs-and-spokes metaphor, Coast WebMaster opts for a page/subpage view similar to the main view of Microsoft FrontPage, and WebAnalyzer provides a unique "wavefront" view, in which the entire site is presented as an array of concentric circles.

In all three packages, the trick is in giving the user a way to see and select specific pages with specific problem URLs. A simple report could do the same job, but locating a dysfunctional link in a site containing hundreds of pages would be practically impossible. A graphical site display is better, but only if the problems are clearly marked. With very large sites, the display is especially important, because the sheer number of graphically rendered links could actually hinder visibility. For this reason, diagnostic software offers filtered views, showing you only specific areas of the site or problem pages and links. The software should make it possible to move to a problem quickly to make changes.

Of course, modifying a Web site is frequently not just a matter of editing one specific page, nor of performing the task locally. Often a change in a URL affects several pages, especially in a site with an intricate link architecture, and once you've made changes, you need a way to upload altered files to the server. Web diagnostic software makes these tasks possible in a number of ways. First, there's typically a means of performing a search-and-replace across an entire set of documents, so that a change in a URL will cause all referring pages to be updated quickly and consistently. Second, File Transfer Protocol (FTP) should be built into the software, to facilitate uploading. Neither feature is strictly necessary, of course. It's entirely possible to edit each document by hand, or load it into site creation software and perform a search-and-replace. And it's equally possible to upload individual files with a dedicated FTP program. The point of site management software, however, is to help you eliminate the number of steps required to perform repairs, so these features become, in fact, essential.

One significant problem in mapping and displaying Web site architecture is the fact that not all Web pages are instantly accessible. Some require user names and passwords; others ask users to fill in forms. Web diagnostic software offers a means of submitting such information automatically, after you've presented it once. When you first scan a site, the software presents you with each page that needs your input; the program then saves the information you submit with the site and automatically submits it for you each subsequent time you scan the same site.

Although Web diagnostic software strives to provide a total picture, there are some limitations. On a site that relies on extensive search procedures—a Web search engine, for instance—it is the search that determines the actual number of pages and the links that appear on them. It would be unrealistic to try to capture all such instances, nor is it necessary. Web users are well aware that the quality of links that appear in search engines is unpredictable, and such links aren't really considered part of your site.

SO WHICH ONE?

First it must be said that you can't go wrong choosing any of these three packages. But you could go very wrong in not choosing one at all, because having a dysfunctional Web site is even worse than having a boring or outdated one. Each of these programs can help you keep your site in good repair.

Your decision, of course, should be based on what you want to accomplish. In that regard, each program offers a different kind of value. Astra SiteManager deals well with dynamic content, provides a highly visual view of your site, and offers rudimentary analysis of hits. Coast WebMaster provides several useful

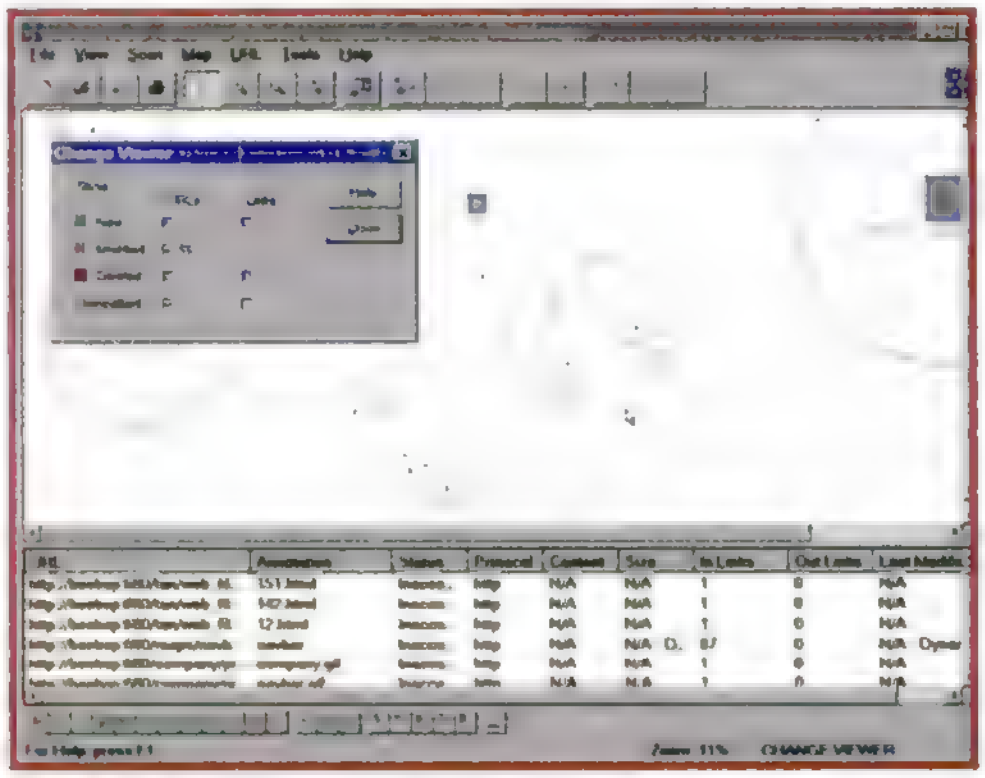

FIGURE 2: *When comparing two sites, SiteManager displays changed URLs and links in specific colors within the Visual Web Display, depending on which changes you've selected in the Change Viewer dialog.*

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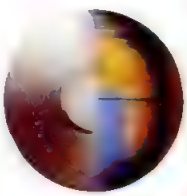

Ziff-Davis Benchmarks: The Whole World Watches

ZD Ziff-Davis Publishing

Ziff-Davis Benchmark Operation, 1001 Aviation Parkway, Suite 400, Morrisville, NC 27560

views, a built-in Internet Explorer–compatible browser, the ability to edit directly to the Web server, and provision for entering multiple data sets into active forms. WebAnalyzer gives you an excellent three-pane view as well as the useful option of copying an entire site to your local machine.

It should be noted that Coast WebMaster offers the most visually elegant display and the most usable feature set. Like Astra SiteManager, however, it is quite expensive. If that's a concern, you'll want to consider WebAnalyzer. Of course, the software could pay for itself many times over by fixing just one important link, such as a link to a product order form, and that must figure in your purchasing decision. Whichever product you choose, this is must-have software for the serious Webmaster.

Mercury Interactive Corp.

Astra SiteManager

Astra SiteManager 1.0, from Mercury Interactive Corp., bases its visual interface around the idea of the hub and spokes of a wheel. We can envision any given page as the hub and the links that lead from it as the spokes, and by clicking on a hub we can get a visual representation of those links and where they lead. In practice, Web sites can easily become too large to be represented from a global perspective in this way, with a core hub appearing to have unlimited spokes leading from it. But through a workable zooming feature, Astra SiteManager lets you narrow down the view of the site and proceed from there.

The primary site representation is called the Visual Web Display, which updates on the fly after you initiate the site scan. If the site takes too long to map (large sites can take several minutes, even an hour, depending on the speed of your connection) you can pause the scan and resume it later, or you can cancel the scan and work with what you have. Scanning operates in the background, so you can interact with the program in whatever way you wish.

The Visual Web Display gives a representation of the site as if you were looking at it from "above," with the home page appearing as an icon at the hub and icons for each linked file attached by spokes to that hub. It's rare that the home page is the only hub in a large site, and SiteManager takes that into account by displaying "subhubs." The home page might have a dozen links leading from it, each of which is shown as a spoke, but each of the dozen might also have a dozen linked documents. In such a diagram, the home cluster would be attached by 12 spokes to 12 other clusters, and so on.

You can zoom in or out from your selected URL to focus on a specific section of a site. That is essential with a large site, such as the ZDNet site shown in Figure 1. Depending on your magnification, you get one of two views.

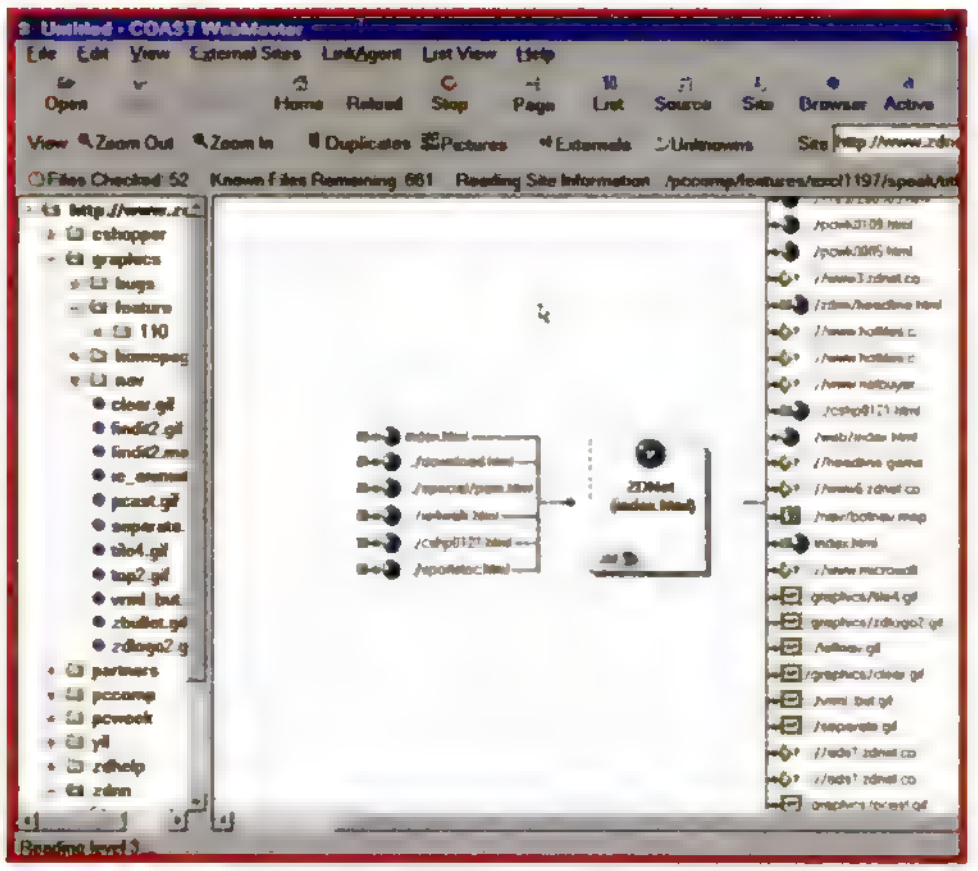

FIGURE 3: *WebMaster offers two viewing panes, the File view on the left and the main view—here showing the Page view option—on the right.*

At low magnification, you get only the URL status. High magnification gives you both the URL read status plus an icon representing the HTML type. URL status conditions include *Not Found, Inaccessible, Access Denied, Unread,* and *OK,* with *Access Denied* denoting a lack of permissions and *Unread* a failure to access the URL (typically caused by nonfunctioning external links or forms that require user input). URL types include *HTML, HTML with Forms, Image, Audio, Video, CGI Script, Java Applet, Redirection,* and *Plain Text,* among others.

Information about each URL is provided in the Textual Display. There you'll find the status of the URL, the type of protocol used to access it, the number of links leading into and out of the URL, the type of MIME content of the target file, and the date of the file's last modification. You can sort according to these and other criteria, or you can minimize the number of URLs in the Visual Web Display and the Textual Display by selecting from the Filter toolbar at the bottom of the SiteManager window. By filtering, you can hide specific URL types or statuses from the display. These include all URLs with *OK* status (they don't need any repair work); all URLs with FTP or Mailto protocols; all Java URLs, audio URLs, or form-based URLs; and so on. Selecting the right filters lets you narrow down the view of your site to precisely what you need.

To map a site that contains a form, SiteManager offers Dynamic Scan. To initiate it, you need to be on a site containing a form, at which point the *Dynamic Scan* option appears in the Scan menu. Launch it and the form is loaded into your browser. SiteManager records the data you type into the form fields and continues to map the site. The program then saves this information for future scans of that site. You can view the typed-in data at any time through the *Form* tab of the URL's Properties menu.

Two other features should be noted. SiteManager lets you compare two versions of a site, as long as you save them with different filenames. The Change Viewer shows you how many new, modified, deleted, and unmodified URLs and links are part of the site. Changes appear as color-coded icons in the Visual Web Display and as files in the Textual Display (see Figure 2). You can view the version you wish by adjusting the Change Viewer. The other significant feature is ActionTracker, which analyzes your server's log files and superimposes an activity grid over the Visual Web Display. The information is expressed as number of hits in a color-coded range from URL to URL. ActionTracker is no substitute for dedicated site analysis software, but it's a useful gauge of your site's visitor activity.

Astra SiteManager 1.0. List price: $495. Mercury Interactive Corp., Sunnyvale, CA; 800-837-8911, 408-523-9900; fax, 408-523-9911; www.merc-int.com. *Choose 550 at www.pcmag.com/infolink.*

Coast Software Inc.

Coast WebMaster

Despite its lack of a central metaphor comparable to Astra SiteManager's hubs and spokes or WebAnalyzer's wave, Coast WebMaster 2.0 offers an impressive array of options. As Figure 3 shows, WebMaster's window looks like Microsoft Internet Explorer's, and in fact the program is designed to work hand in hand with IE. One of the options in WebMaster is to configure the Browser view to work with your browser. If your browser is IE (Version 3.0 or higher), WebMaster's Browser view will display pages directly in the main window. Other browsers will be launched and selected files opened inside them.

The File view appears at the left of the

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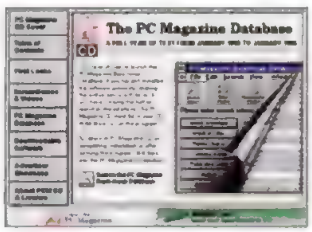

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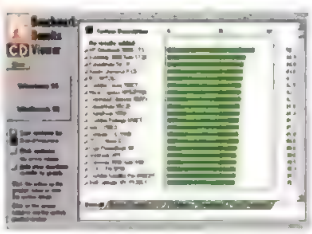

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WebMaster screen and provides a Windows Explorer–like hierarchical look at the site. Clicking on any file centers the main view on that document. The main view pane can display one of six different views. The default is Page view (shown in Figure 3), which displays a selected document with incoming links appearing to the left and outgoing links to the right. List view provides a listing of files, in columns for path, filename, title, author, size, modification and creation dates, and inbound and outbound links. In addition, WebMaster provides HTTP code for each document (200, for example, means a successful HTTP negotiation) and, in the case of local sites, tells whether the file has a virus. Unfortunately, the latter feature works only with McAfee's VirusScan, Version 2.0 or later, but the idea is solid. It would be helpful if scans could be done on remote files as well, but a remote server would be unlikely to allow access to a local virus checker.

WebMaster switches to Active Scan view whenever it encounters documents that require data. The document is loaded into WebMaster, and you type in the data. One especially useful feature allows you to enter as many sets of data as you want for any given data-driven page. Also highly useful is WebMaster's ability to handle not only CGI forms but ActiveX and Java or JavaScript forms as well. As with any dynamic scanning system, search engines yield entirely different results depending on the form data, so mapping such sites has limited usefulness. For database-driven forms, however, WebMaster's capabilities are strong.

In order to check links automatically, WebMaster provides a Link Agent. The Scheduling Wizard lets you schedule link checking across multiple sites, determining and displaying nonworking links in its results. (If you've upgraded from the Windows System Agent—part of Microsoft Plus!—to the Task Scheduler in IE4, however, you must schedule from within My Computer. The wizard doesn't help.)

WebMaster offers an important feature for Web site repair: You can edit files and have them automatically uploaded via FTP to your Web server. You don't have to perform tedious (and easy-to-forget) FTP duties yourself. But there is a trade-off. Your FTP and HTTP sites must mirror one another exactly, to ensure that pathnames are identical, and the FTP process works only if you work in Source view (editing HTML source text), not through a standalone HTML editor. Still, since the purpose is to repair broken links, and since WebMaster also includes a global search-and-replace function, the feature is useful.

Coast WebMaster 2.0. List price: $495. Coast Software Inc., Ottawa, Ontario, Canada; 613-567-3201; fax, 613-567-0690; www.coast.com. *Choose 551 at www.pcmag.com/infolink.*

InContext Systems

WebAnalyzer

The primary metaphor for displaying Web sites in InContext Systems' WebAnalyzer 2.0 is the wave, and indeed the program's main window is called the Wavefront view. The entire site is presented as a set of concentric circles (see Figure 4), with each ring representing one level of links within the site, arranged by number of clicks away from the home page. Initially that might seem less representative of a Web site's structure than the other products' approaches, but in practice the Wavefront view makes for an easy-to-use display that quickly shows you your site in all its complexity.

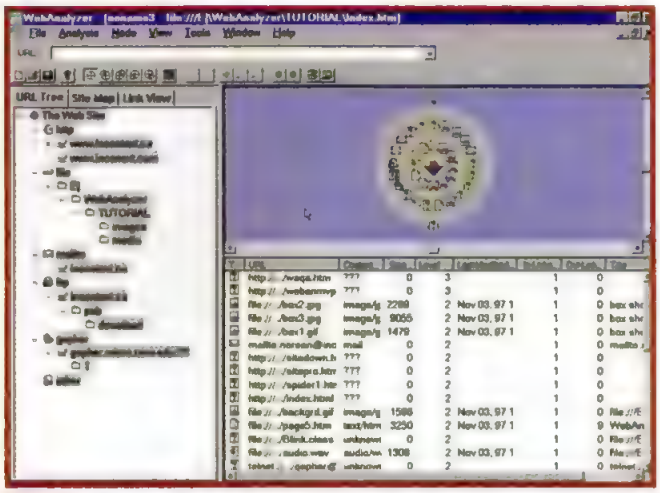

FIGURE 4: *WebAnalyzer features the Wavefront view at top right, with the URL Tree view on the left and the List view at bottom right.*

As Figure 4 also shows, WebAnalyzer's main window offers two other views, List view and URL Tree view. List view gives you a listing of the files that make up the site, expressed as URLs with protocol prefixes. File information available from this view also includes the MIME content type, the file size, the level of the Web site at which the file can be found, the number of incoming and external links, and the document's title. Clicking on any file in this view highlights the file in Wavefront view, double-clicking loads it into your browser, and right-clicking brings up a menu that lets you load the file into an editor or view its properties. URL Tree view provides a cascading hierarchical view of the site similar to Windows Explorer's. By expanding the headings, you can locate the document you wish to examine, and clicking on the document changes the Wavefront and List views to reflect that document as the new first level. Also available in URL Tree view are the site map and Link view; the latter shows the links into and out of the selected document in List or Wavefront view.

To begin an analysis in WebAnalyzer, you type in the URL or load the appropriate HTML file. The program offers several analytic options, including the ability to download the entire site contents to your hard disk. That can be useful if you're editing an entire site from a remote location, but be careful not to download the entire Netscape, Microsoft, or ZDNet site (your hard disk might not be large enough, nor your patience deep enough). Other choices include checking external links and generating automatic reports. Report options are numerous as well. You can include information about failed links, successful and failed links to multimedia, page summaries, and site statistics (a compilation of link information).

To make analysis of a large site manageable, WebAnalyzer lets you filter the types of documents you wish to include. In the Filter Setting dialog, you can establish up to four filters, with which you select the MIME types you wish to analyze, the type of link (failed, working/untested, or all), and the minimum size of the node chosen for analysis.

Not available in WebAnalyzer, however, is the ability provided by both SiteManager and WebMaster to generate data for forms and thus perform an analysis of sites requiring dynamic information. Also not available is WebMaster's ability to provide useful information about Java applets and ActiveX controls. However, WebAnalyzer's options and its ability to copy the site to a local server should make up for those omissions for specific users.

WebAnalyzer 2.0. List price: $299.99. InContext Systems, Toronto, Ontario, Canada; 800-263-0127, 416-922-2515; fax, 416-922-6489; www.incontext.com. *Choose 552 at www.pcmag.com/infolink.* PC

Neil Randall is the author of The Soul of the Internet *(ITCP) and* Special Edition Using Microsoft FrontPage 98 *(Que).*

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A Guide to DirectX

Multimedia and game developers now have a way to build hardware access directly into their programs.

By Neil Randall

Like political candidates in an election year, Windows 95's developers promised that the new operating system would make life easier for both users and programmers. And not unlike many campaign promises, this vow has been only partially fulfilled. Windows 95 has certainly made life easier for users—but the jury's still out on programmer benefits.

Among the promises made was that programmers would be able to build games and applications without worrying about each user's individual components, such as sound and video cards and printers. The idea was that the operating system would contain the drivers and would worry about making the transition from program to hardware. Compare this with the days of DOS, when each program had to include a raft of video and sound drivers (WordPerfect 5.1 is probably the best example), and you can see how the simplification would help.

In the area of full multimedia programming, however, Windows 95 fell short. In response, Microsoft developed a technology specifically for game developers called WinG, which eventually became known as DirectX. DirectX, now in Version 5.0, is just beginning to live up to its initial promise. (It should be noted that for some reason Microsoft moved the technology directly from Version 3.0 to Version 5.0. The company has done this before, when Word went from 2.0 to 6.0; maybe it's just a plot to drive tomorrow's computer historians insane.)

DirectX is a set of application programming interfaces (APIs) and programming tools that make it possible for programmers in Windows 95, as well as in the upcoming Windows 98 and Windows NT 5.0, to build hardware access into their programs without needing to know the specific hardware configuration of an individual computer. In other words, programmers can access hardware in a generic way, but without having to default to lowest-common-denominator standards. For video, this means you can take advantage of the advanced features of a video card, such as 3-D, without having to program specifically for each ATI, Diamond, Matrox, Number 9, or any other video card that supports 3-D. In effect, DirectX acts as an intermediary between the program and the hardware driver (the driver is the piece of software that lets an operating system communicate with a piece of hardware), translating generic commands into hardware-specific commands.

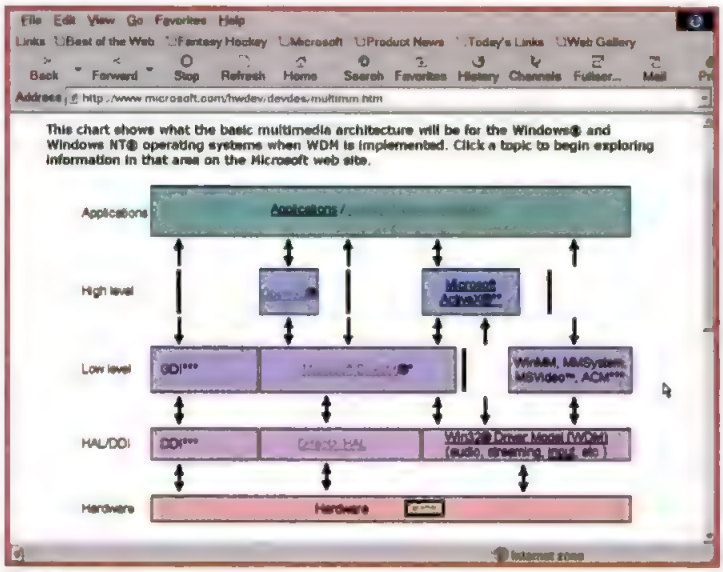

FIGURE 1: *This chart from the Microsoft Web site shows the relationship among the DirectX components and other multimedia technologies that will be in place with Windows 98 and Windows NT 5.*

THE PURPOSE OF DIRECTX

The original purpose of DirectX was to enable Windows 95 to become a respectable gaming platform. Games have always pushed the technical envelope of PCs. Sound cards and video resolutions beyond EGA were originally developed to meet the needs of game developers. But in its early days Windows 95 was far slower and less adaptable as a gaming environment, primarily because direct access to hardware was not possible. Designers largely ignored this platform because of performance concerns, electing to run their games in a DOS window, from separate DOS boot disks, or, more typically, from a restart into DOS. But this required 16-bit DOS drivers, not Windows 95's 32-bit virtual drivers. And that meant headache after headache for users, many of whom bought games that simply wouldn't run on their machines. DirectX is an attempt to solve this series of problems.

But as multimedia has spread to mainstream applications, DirectX has ceased being a game technology only. In fact, if you've installed Internet Explorer 4.0 on your Windows system, you've also installed DirectX. Specifically, IE 4 ships with five components of DirectX 5.0: DirectDraw, DirectSound, Direct3D, DirectShow, and DirectAnimation. We'll look at each of these components a little later, but the point is that as part of IE 4, they have moved very clearly into mainstream use; you'll be seeing an increasing number of multimedia applications and documents that depend on DirectX for proper functioning.

DirectX will move completely into the mainstream with the release of Windows 98 and Windows NT 5.0. It will be an integral part of both operating systems, working hand in hand with the new Win32 Driver Model (WDM) to enable faster and more complete hardware support. (The multimedia architecture is represented in the chart from Microsoft's Web site shown in Figure 1.) In fact, DirectX operates in Windows 98 and NT 5.0 at a lower layer than the industry standard, OpenGL (also built into the operating system). OpenGL, developed by Silicon Graphics, offers an interface for 3-D graphics and is used more for simulation and visualization applications than for games. It fits into the High-Level layer of the Windows 98/NT 5.0 architecture—just below the applications layer—relying on DirectX, which resides on the Low-Level layer, for optimal hardware support.

This is hardly good news for the many proponents of OpenGL. The debate over OpenGL and DirectX, although not as public as the debate over Java and ActiveX, resembles that dispute. To be more precise, the dispute is between OpenGL, a 3-D–rendering standard, and Direct3D, the corresponding component in DirectX. (OpenGL will be included in Windows 98 and Windows NT 5.0, and it is already available with current versions of Windows NT 3.51 and with Windows 95 OSR2.) OpenGL and

Direct3D work similarly, but according to some industry watchers, OpenGL is simply a better design. In fact, the DirectX 5.0 component DrawPrimitive, which renders simple points and lines in DirectDraw, is based largely on the rendering techniques in OpenGL. In other words, Microsoft seems to be cloning many OpenGL features, leaving developers wondering why this is necessary if OpenGL already exists. Microsoft's answer is that Direct3D offers an important additional layer between the software and the hardware, providing compatibility with a wider variety of video devices, but many see that layer as adding unnecessary complexity. This debate is not likely to end soon.

THE DIRECTX FOUNDATION

Debate or no debate, DirectX is here to stay. Let's take a look at what it consists of. The starting point is the DirectX foundation, which is made up of a number of technologies that offer access to different hardware types. These include DirectDraw, DirectSound, DirectInput, and Direct3D. The foundation is based on two interfaces with hardware. The Hardware Abstraction Layer (HAL) acts as an intermediary between the software and the hardware devices, allowing developers access to those devices without requiring them to know the brands, models, or other details. The Hardware Emulation Layer (HEL) is where DirectX features can be emulated if the device itself does not support those features. The most frequently emulated feature is 3-D, which many accelerators do not support but which is becoming increasingly common in multimedia applications and games. Obviously, emulation isn't as good as the real thing, but at least the developer will only need to develop one version of the software.

The DirectX foundation provides that basis for an entire modular system. The modules are called components, and the list of these components continues to grow. Technologies such as ActiveX can call on DirectX for multimedia implementation, and DirectX also works hand in hand with the Graphics Device Interface (GDI). DirectX 5.0 has also been designed to work with Microsoft's upcoming Talisman technology. With Talisman, Microsoft hopes to offer a standard (or at least a Windows standard) that will work directly with hardware to produce better 3-D graphics through a combination of stronger techniques for antialiasing (eliminating "jaggies"), texture filtering (eliminating blurring when images are tilted), and animation.

DIRECTDRAW

DirectDraw was, in effect, the opening salvo for DirectX, providing developers with the ability to access hardware more directly than is possible through the Windows 95 virtual–device-driver system. The result is an increase in graphics speed, necessary for the successful implementation of games. With the advent of DirectDraw, game developers were finally able to consider Windows 95 a serious gaming platform. Other multimedia applications were also able to make use of this technology, which helped account for their rise in popularity.

DirectDraw works in conjunction with the HAL and HEL. It gives developers a common user interface to hardware devices, with the actual interaction occurring at the HAL. If the hardware is not compatible with a feature requested by a program, the HEL will attempt to emulate the feature as closely as possible.

In many ways, DirectDraw is just a video-memory manager. It offers an interface to video memory through the use of four objects: the `DirectDraw` object, the `DirectDrawSurface` object, the `DirectDrawPalette` object, and the `DirectDrawClipper` object.

`DirectDraw` is the primary object and represents the hardware device. It can be set to run the application in full-screen or windowed mode, and even in exclusive mode if the developer wants to ensure that no other program accesses the same hardware devices. Developers can also program the `DirectDraw` object to set the video resolution; an increasing number of games make use of this feature to change the resolution on the fly.

`DirectDrawSurface` objects let developers work with graphics stored in memory. Surfaces are divided into primary surfaces (currently on-screen), back buffers (next in line to go on-screen), and off-screen surfaces (waiting to be queued). The idea is to move graphics from off-screen surfaces into the back buffer, then from the back buffer to the primary surface. `DirectDrawPalette` objects allow a different 256-color palette for each surface or shared palettes across surfaces. DirectDrawClipper provides a means for bypassing the GDI for applications designed to run in a window, preventing graphic delays.

DIRECTSOUND AND DIRECTINPUT

DirectSound operates as an interface to sound and music hardware. It's a playback mechanism for .WAV files and makes use of primary, secondary, static, and streaming buffers. The primary buffer is the one currently being used by the computer and draws sound files from the secondary buffers (each .WAV file has its own secondary buffer). Small files can be held in static buffers for fast access, while longer files can be partially loaded and cycled in streaming buffers. DirectSound contains a mixer that controls everything from volume to 3-D sound effects, drawing on the secondary buffers.

DirectInput provides an interface to input devices (mostly game controllers). Gamers want joysticks and other controllers, of course, and DirectX includes DirectInput to accommodate those wants. DirectInput offers support for up to 16 joysticks, 32 buttons, and 6 movement axes. Again, the principle is to allow developers to program for these devices, allowing the HAL or HEL to handle the actual hardware. DirectInput is not restricted to game controllers, however: It is also the interface for input items such as graphics tablets.

THE MEDIA AND COMPONENT LAYERS

Above the foundation layer of DirectX is the media layer. Through the media layer, developers can integrate the components of the foundation layer to produce true multimedia. These high-level activities can be found in the even higher-level *components* layer, which consists of applications built on top of the foundation and the media layers. Examples of components include NetMeeting, NetShow, and ActiveMovie, all of which ship with IE 4, Windows 98, and Windows NT 5.0.

The media layer itself consists of DirectShow, DirectModel, DirectAnimation, DirectPlay, Direct3D Retained Mode, and VRML. DirectShow is one example of building into the operating system functionality that was previously provided by third-party plug-ins or add-ins. It provides a means for the playback of audio and video streams in a variety of formats—QuickTime, AVI, WAV, and MPEG. It does so through a series of interrelated filters that interact with the foundation layer according to whatever activities they're required to perform. These filters are connected in a filter graph, enabling them to perform complex functions. The filters are connected with the data stream through the filter graph manager. (For more information on DirectShow, see the Operating Systems column "A New Architecture for Multimedia," in the January 6, 1998, issue of *PC Magazine*.)

The other media-layer components offer similar high-level functionality, each designed to assist developers in using the multimedia hardware to its fullest. Each, in fact, deserves a write-up the size of this column, but because of space limitations we'll just give you an overview. DirectModel provides a means for rendering and interacting with large three-dimensional graphics objects, those that won't

fit into physical or virtual memory. DirectAnimation allows developers to combine sounds, movies, images, and text (two- and three-dimensional) and associate them with timed and user-initiated events to offer mixed-media animation. DirectPlay is designed expressly for online gaming, allowing for the display of multimedia across networks, finding games in progress (the game lobby), and message sending among players. Microsoft's Internet Gaming Zone (*www.zone.com*) makes full use of DirectPlay for its over-the-Internet play. VRML (Virtual Reality Modeling Language) makes use of DirectX to implement 3-D virtual worlds in Web browsers, speeding the process of drawing these worlds considerably.

Finally, Direct3D Retained Mode allows developers to combine media to create three-dimensional scenes and to manage these scenes in applications. The Direct3D file system allows storage of animation sets, including the ordering of objects—the animation path—for correct playback of images in the animation. It also stores textures, meshes, and other details necessary for 3-D rendering. Actually, Direct3D Retained Mode is only one of two 3-D modes available with DirectX, although it is certainly the more powerful. Direct3D Immediate Mode, which resides on the DirectX foundation layer, offers developers a more direct access to hardware features and appeals to experienced 3-D programmers. Speed and flexibility are enhanced in Immediate Mode, but all scene rendering and management are on the programmer's shoulders.

DirectX is necessary only because the PC remains an open system, with numerous manufacturers of multimedia peripherals (sound cards and video cards) offering increasingly sophisticated products. If there were true video and audio standards, developers would be able to design right to the hardware, without the need for the buffer between hardware and software that DirectX provides. But one of the goals of the Windows design team (especially the Windows NT developers) is to stop direct hardware access, eliminating the possibility of improperly written applications that can crash entire systems when they touch the hardware itself. Not everyone is in favor of the DirectX solution—primarily because it is Windows-specific and controlled by Microsoft—but there's no question that DirectX has made widely disseminated Windows multimedia not just better, but possible. PC

Neil Randall is the author of The Soul of the Internet *(ITCP) and* Special Edition Using Microsoft FrontPage 98 *(Que).*

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The Windows Scripting Host

A language-independent scripting host for 32-bit Windows platforms.

By Paul Modzelewski

As a Microsoft Windows user, you may have been frustrated by the lack of scripting tools. If only there were a tool comparable to AppleScript on the Macintosh. DOS batch files aren't really Windows-aware, and third-party tools have some problems: They usually cost a lot of money, and you can't depend upon a user having them installed. Luckily, Microsoft recently released its Windows Scripting Host, the long-awaited replacement for DOS batch files. To understand exactly what the Windows Scripting Host is and why you should care, you need to understand a little bit about Active Scripting.

ACTIVE SCRIPTING

Active Scripting is a relatively new scripting standard from Microsoft. There isn't enough space in this article to discuss it thoroughly, so we'll take a quick look at Active Scripting from 10,000 feet.

Until now, there was not a standard method of adding scripting support to applications under Windows. If you wanted to make an application scriptable, there were two choices: one, roll your own scripting, or two, buy a third party's scripting technology. Both of these solutions are less than perfect, and both lock the developer into a proprietary technology.

To remedy this situation, Microsoft introduced Active Scripting—a set of ActiveX interfaces that let developers add language-independent scripting to their applications. That's important, so I'll say it again—language-independent scripting. Active Scripting accomplishes this by using two main components, scripting hosts and scripting engines.

Any application that can be driven by Active Scripting is a scripting host. From the scripting host's point of view, there is no scripting language; that is, the host does not process any scripting-language commands. The host starts a scripting engine, feeds lines of a script to it, and responds to its output, but the host never looks at the actual script. The scripting engine deals with all language-dependent issues.

A scripting engine must be written for each scripting language that Active Scripting supports, although to the scripting host, they all look the same. Microsoft currently supplies scripting engines for VBScript and JavaScript, and third parties are working on scripting engines for Perl, Rexx, Python, and other languages. The beauty of this scheme is that it lets end users write scripts in the languages they like best.

With the above background, the name *Windows Scripting Host* probably has a little more meaning to you now. At a base level, the Windows Scripting Host is an Active Scripting host that lets scripts be executed in the Windows shell. You can write a script in any supported language, and the Windows Scripting Host will use the script file's three-character extension to determine what language you wrote the script in (.VBS for VBScript, for example) and which scripting engine to start.

THE WINDOWS SCRIPTING HOST OBJECT MODEL

Every Active Scripting host must expose some functionality that scripts will act upon, which is referred to as the host's *object model*. As you might expect, the Windows Scripting Host's object model exposes several objects that can be used to access different components of the Windows shell, such as shortcuts, network drives, and network printers.

The `WScript` object is the heart of the Windows Scripting Host object model. One instance of this object is always available, and it is always named `WScript`. `WScript` is used to obtain information about the currently running script and the Windows Scripting Host itself. It creates every object used by a script in the Windows Scripting Host, either directly or indirectly. The method used to create new objects is, unsurprisingly, `CreateObject`. To create a `WshShell` object in `VBScript`, you'd make a call like this:

```
Dim WshShell
Set WshShell = WScript
.CreateObject("WScript
.Shell")
```

It is also important to note that the `CreateObject` function can be used to create OLE Automation objects as well as Windows Scripting Host objects; this means that you can use the Windows Scripting Host to script any application that supports OLE Automation. Some of the samples included with the Windows Scripting Host use data read from an Excel spreadsheet (using Excel's OLE Automation interface) to add and remove users in the Windows NT Directory Service. There are many interesting and powerful ways to use this kind of scripting functionality, particularly for IS folks.

THE WSHSHELL AND WSHNETWORK OBJECTS

The only two objects in the Windows Scripting Host object model that you can create directly are `WshShell` and `WshNetwork`;

```
Dim WshNetwork
Dim fs, listFile
Dim nameString, driveNum, driveString

Set fs = WScript.CreateObject
("Scripting.FileSystemObject")
Set listFile = fs.OpenTextFile("c:\wsh\list.txt")

Set WshNetwork = WScript.CreateObject("WScript.Network")

Do While listFile.AtEndOfStream <> True

nameString = listFile.ReadLine

For driveNum = 26 to 5 Step -1
      driveString = Chr(driveNum + 64) & ":"
      On Error Resume Next
      WshNetwork.MapNetworkDrive driveString, nameString
      If Err.Number = 0 Then Exit For
Next

If driveNum <= 5 Then
      WshShell.Popup("No drive letters available.")
End If

Loop

listFile.Close
```

FIGURE 1: *This script reads a list of UNC names from a text file and maps a network drive to each name.*

the rest are obtained by calling methods of WshShell and WshNetwork. For instance, if you wanted to create a new WshShortcut object, you would use the following VBScript code:

```
Dim WshShortcut
Set WshShortcut = WshShell
.CreateShortcut
("c:\shortcut.lnk")
```

WshShell performs a number of useful shell-related tasks. It retrieves information about the machine, such as processor type, number of processors, and OS version number. WshShell can also return the path to special folders, such as those for the desktop or Start menu. There are even methods for creating, modifying, and deleting Registry entries. The WshShell.Popup method presents the user with a dialog box that you can use to obtain simple yes/no answers from the user. The scripting language you use will probably have functions to handle more complex interactions with the user.

If you need to deal with network drives or network printers, you'll need to use the WshNetwork object, which has functions to handle mapping and disconnection. WshNetwork can also enumerate all the currently mapped network drives and printers. It does this with the methods EnumNetworkDrives and EnumPrinterConnections, both of which return WshCollection objects. WshCollection can be obtained only by calling the two enumeration functions in WshNetwork, and it is exactly what the name would suggest—a collection of items, either network drives or network printers.

PUTTING IT TOGETHER

To demonstrate how to use the functionality of the Windows Scripting Host, we'll walk through the creation of a script that reads a list of UNC names from a text file and maps a network drive to each name (see Figure 1). *UNC* stands for *Universal Naming Convention,* and it is used to identify folders shared on the network. For instance, if your computer is named "MyWin95" and you have shared a folder as "Downloads," the UNC name for that folder would be "\\MyWin95\Downloads."

This demo uses VBScript, but it could be implemented in any Active Scripting language. After running the script, you should see new drives in Windows Explorer that correspond to the names in your List.txt file.

The first thing we need to do is open the text file that contains the UNC names. VBScript has two built-in objects we'll use to read a file, FileSystemObject and TextStream. The following two lines of code handle the opening of an existing file:

```
Set fs = WScript.CreateObject
("Scripting.FileSystemObject")
Set listFile = fs.OpenTextFile
("c:\wsh\list.txt")
```

```
Dim WshShell, WshUrlShortcut
Dim fs, listFile
Dim urlString, nameString, desktopFolder

Set fs = WScript.CreateObject("Scripting.FileSystemObject")
Set listFile = fs.OpenTextFile("c:\wsh\url.txt")

Set WshShell = WScript.CreateObject("WScript.Shell")

desktopFolder = WshShell.SpecialFolders("Desktop")

Do While listFile.AtEndOfStream <> True
 nameString = listFile.ReadLine
 urlString = listFile.ReadLine

Set WshUrlShortcut = WshShell.CreateShortcut(desktopFolder &
 "\" & nameString & ".url")
 WshUrlShortcut.TargetPath = urlString
 WshUrlShortcut.Save

Loop

listFile.Close
```

FIGURE 2: *This script reads URLs from a text file and creates URL shortcuts on the desktop.*

The first line calls WScript.CreateObject to get a new FileSystemObject. Then the new FileSystemObject's OpenTextFile method is called and returns a TextStream object. This TextStream object will be used for the rest of the script to read text from the file, one line at a time. The next thing we need to do is initialize a WshNetwork, like so:

```
Set WshNetwork = WScript.CreateObject
("WScript.Network")
```

With the initial setup complete, it is time to implement the main loop. Even if you've never used VBScript, if you have a general understanding of programming or scripting, you should be able to follow this. The first section of the loop is the Do While:

```
Do While listFile.AtEndOfStream <>
True
```

This keeps the loop cycling as long as we haven't reached the end of the file. AtEndOfStream is a property of TextStream that automatically gets set to True when the last line of the file is read. The next line of code actually reads a single line of text from the file and inserts it into a variable:

```
nameString = listFile.ReadLine
```

The following For loop ensures that any available drive letter will be used. Notice that we start at position 26 (Z) and move backward to position 5 (E). The expression Chr(driveNum + 64) translates the drive number into the corresponding capital letter. Also, normally, if a user attempts to map a network drive to a letter that already exists, an error message would appear and execution of the script would halt; the On Error Resume Next statement causes this message to be suppressed so that script execution can continue uninterrupted.

```
For driveNum = 26 to 5
Step -1
 driveString = Chr
 (driveNum + 64) & ":"
 On Error Resume
 Next
 WshNetwork.MapNet-
 workDrive driveString,
 nameString
 If Err.Number = 0 Then Exit For
Next
```

If the driveNum variable reaches a value of 5, then no available drive letters have been found. This is a bad situation, so displaying a dialog in order to let the user know about it is a good idea.

```
If driveNum <= 5 Then
WshShell.Popup("No drive letters
available.")
End If
```

At this point, the only things that are left to do are to end the loop with the Do While statement and to close the TextStream that

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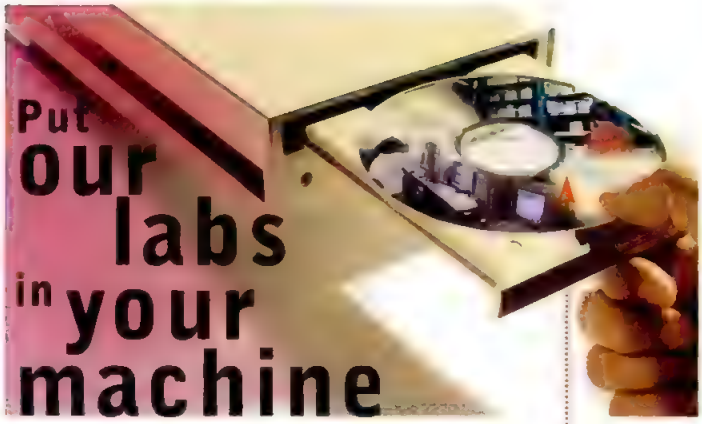

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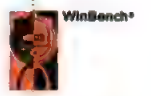

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we used to read the UNC names.

```
Loop
listFile.Close
```

This sample merely scratches the surface of possibilities. The functionality that the Windows Scripting Host object model exposes, combined with the power of being able to script any application that supports OLE Automation, should give quite a few IS shops a big boost.

For those who do not have access to a LAN, Figure 2 shows another example. This script—which reads URLs from a text file and creates URL shortcuts on the desktop—works much as the UNC sample does, with a few minor differences. The biggest difference is that it reads two lines of text for each shortcut: The first line is the name of the shortcut on the desktop, and the second line is the URL. For example, to create a shortcut to *PC Magazine*'s home page, you'd include the following two lines in Url.txt:

PC Magazine's Home page
http://www.pcmag.com

Both scripts are available for downloading on *PC Magazine*'s Web site.

The Windows Scripting Host is a rather low-profile product, and if you haven't been paying close attention, you may have missed it. The documentation is weak and, in many cases, does not match the actual methods available. All these factors lead me to believe that Microsoft is missing the boat on this one. Why go to the trouble of implementing this technology without really letting people know about it? Only Bill can answer that question.

As a developer, I have found the Windows Scripting Host to be extremely useful. I use it for everything from mucking about with Registry entries to making it easy for my girlfriend to map drives on the LAN in my home. The Windows Scripting Host seems to be a rapidly evolving piece of software, and hopefully future revisions will contain enhanced functionality.

If you want to get a copy of the Windows Scripting Host, you can find it in several places. The latest version of the Internet Client SDK (a.k.a. Platform SDK, ActiveX SDK, and Sweeper) includes it. If you don't want to download over 100MB just to get it, you can also find it at *www.microsoft.com/management*. Happy scripting! PC

Paul Modzelewski is a software engineer at Group Logic. You can reach him at paul@moon.jic.com.

The Ins and the Outs

InOutBd lets every employee in your company keep track of who's in and who's out.

By John Deurbrouck

In/out boards are about as simple as office equipment gets. You come in, you slide your marker to "In." You go out . . . well, determining what to do shouldn't take too much training. There are two problems with this wonderful piece of equipment, though. First, it's usually in an inconvenient place for the people who set the markers. Your hands may be full when you pass the reception area, or you may not work on the same floor as the in/out board. The second problem is that the only person who can see the board all the time is the receptionist. Other people in the company may also need to know whether a person is in or out of the office.

This month's utility, InOutBd, uses personal computers and a TCP/IP network to put the in/out board on the desk of every employee in the company. The server portion of the utility sits on one computer—for example, at the reception desk—and can be accessed via a browser by anyone on the network. If the server machine is connected to the Internet, it can also be accessed remotely. InOutBd is a 32-bit Windows program that runs under Windows 95 and Windows NT.

You can obtain InOutBd by downloading it from PC Magazine Online or by mail. Refer to the sidebar "Getting the Files" for details. The source code for InOutBd, which was written in Microsoft Visual C++, is also provided for those who are interested in seeing how it works.

USING INOUTBD

InOutBd is a tiny, special-purpose Web server. Anyone on the same TCP/IP network can use a standard Internet Web browser (like Microsoft Internet Explorer or Netscape Navigator) to access InOutBd, check any employee in or out, and see any of several reports. In this section, I will discuss how to set up the employee database and configure InOutBd and how to access InOutBd with a Web browser.

When you first run InOutBd, its main window displays an introductory message, followed by the TCP/IP address of the machine where InOutBd is installed (see Figure 1). As people use the program—update the database, check in or out—the window displays a log of their activities.

The first thing you will need to do is fill in the names that should appear on the in/out board. This is done through the configuration dialog box (shown in Figure 2), which you can display either by clicking the toolbar button with a green check mark or by selecting *Edit | Preferences* from the InOutBd menu. Click *Add on the People page* to add an employee.

InOutBd

InOutBd is an electronic in/out board that runs under Windows 95 and Windows NT. It operates as a Web server on a TCP/IP network, and it can be accessed by users through their Web browsers.

This brings up the InOutBd Person Edit dialog box, where you can enter the employee's name and department. You can sort on the *Department* field in the in/out board display; use this field if you have a lot of employees. Another field, called *Miscellaneous*, can hold any text you like.

Finally, you can associate an image with each employee by selecting an image filename. These images can be displayed on the main InOutBd and on the employee Detail pages. The photographs must be either GIF or JPEG files and must be in a specific directory. By default, this directory is the same as the location of InOutBd.exe; you can change the directory by choosing the *Image* tab in the configuration dialog box.

Below the *Add* button on the People page is a check box that lets you set the size of all images displayed by InOutBd. This option lets you tell the browser to stretch or shrink the images as necessary so they're all the same size (by default, 80 by 100 pixels). A side benefit of this option is that the page will be displayed faster, especially when InOutBd is accessed by modem. Since the browser knows the image size before receiving the image data, it can display the page before the pictures are received. For greatest efficiency, edit the images to the stated size so the browser doesn't have to stretch or shrink them.

Click *OK* to update the database with your changes. All changes you make to the database are held in temporary storage until you click *OK*. InOutBd is fully operational while you are making your database changes, so employees already in the database can check in and out during updates.

Finally, select *File | Save* from the InOutBd menu to save your employee data. Employee databases are stored in files with the extension .IOB. After you've created an employee database, you can start InOutBd by double-clicking an .IOB filename in Windows Explorer or opening an .IOB file with InOutBd's *File | Open* command.

BROWSING THE IN/OUT BOARD

The other settings in the configuration dialog box are optional, so I will save my discussion of them for later. Once you have created an employee database, you can access it from any Web browser on the TCP/IP network. Just point your browser at the TCP/IP address of the computer running the InOutBd server—for example, *http://207.95.65.151*. If you have a dedicated Internet connection, this number will always be the same. If you dial into the Internet, the number will change each time you connect. This address is displayed in InOutBd's main window when you first launch it.

FOR PROGRAMMERS ONLY InOutBd was written with Microsoft Visual C++ 4.2 and MFC (Microsoft Foundation Classes). The full source code for InOutBd is available on PC Magazine Online (*www.pcmag.com*) and demonstrates the following programming techniques:

- creating a simple Web server;
- handling HTTP requests;
- using the WinSock API with MFC;
- using templates and collection classes.

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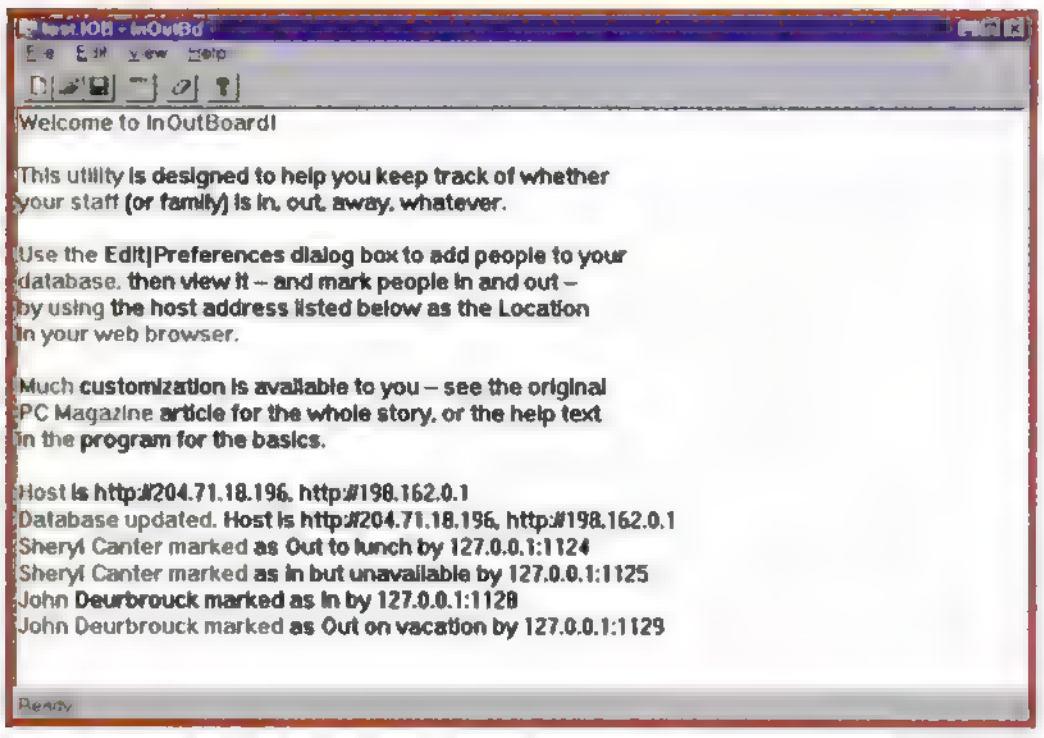

FIGURE 1: *The main InOutBd window displays a welcome message and then a scrolling log of server events.*

You can also refer to the computer by the machine's network name, which will never change. In Windows 95, this is set on the Identification page of the Network applet in Control Panel. So, for example, if the server computer's name is Secret, the URL would be *http://Secret*.

Note that you can test InOutBd on a single computer by using the loopback address, a special TCP/IP address that always points to the computer that you're using: *http://127.0.0.1*.

When you connect your browser to the InOutBd server, you will see the list of employees and their in/out statuses (see Figure 3). The graphic at the top (Keeping Current With InOutBoard) is a hotlink to *PC Magazine*'s Web site. As we will see later, you can change both the graphic and the Web site to which it points. Below this are the words "Complete List." This indicates that both groups of employees, those in and those out, are included in the list. Along the bottom of the screen there is a series of controls, one of which is called *Show(Both/In/Out)*. Click the *In* hotlink to display only those employees who are in, or click the *Out* hotlink to display only those employees who are out.

The *Names starting with* control lets you quickly jump to the first person in the list whose name starts with a particular letter. If you've ordered the list by first name, the first initials will be shown. If you've ordered the list by last name, the last initials will be shown. (How to order the list is discussed below.) Clicking the caret following a person's name will bring you back to the top of the list. To the right of the caret is the person's department (in parentheses), and to the right of the department is a note saying whether the person is in or out.

Each name in the list is a hotlink. If you click on an employee's name, you will see the Detail page for that employee (see Figure 4). The Detail page is where the miscellaneous notes about a person are displayed and where you tell InOutBd whether you're in or out.

Actually, InOutBd gives you more than two choices. You can simply be "Out," or you can be "Out for the day," "Out for lunch," "Out on vacation," or "Out sick." Similarly, you can simply be "In," or you can be "In but unavailable." Each of these choices is a hotlink; click on the one you want to select. Click *main page* in order to return to the main in/out board.

By default, the images associated with employees are displayed on both the main in/out board and the Detail pages. The control at the bottom of the screen called *Pictures(All Pages/Detail Pages/None)* lets you control this. Click *Detail Pages* to display images only on the Detail pages, and click *None* to suppress all image display. If images are displayed on the Detail pages, you can click on the images displayed there to see full-size versions of them.

The control at the bottom of the screen called *Order By(First Name/Last Name/Department)* lets you order the list to make it easier to find people. Click the option you prefer. If you order the list by department, the names are alphabetized by either first name or last name, depending on which was the most recent name-sort setting.

The last control at the bottom of the screen, *HTML(Plain/Use Tables)*, lets you view the in/out board in a table. Only those with very old browsers will be unable to use the table view, which includes headings and is easier to scan.

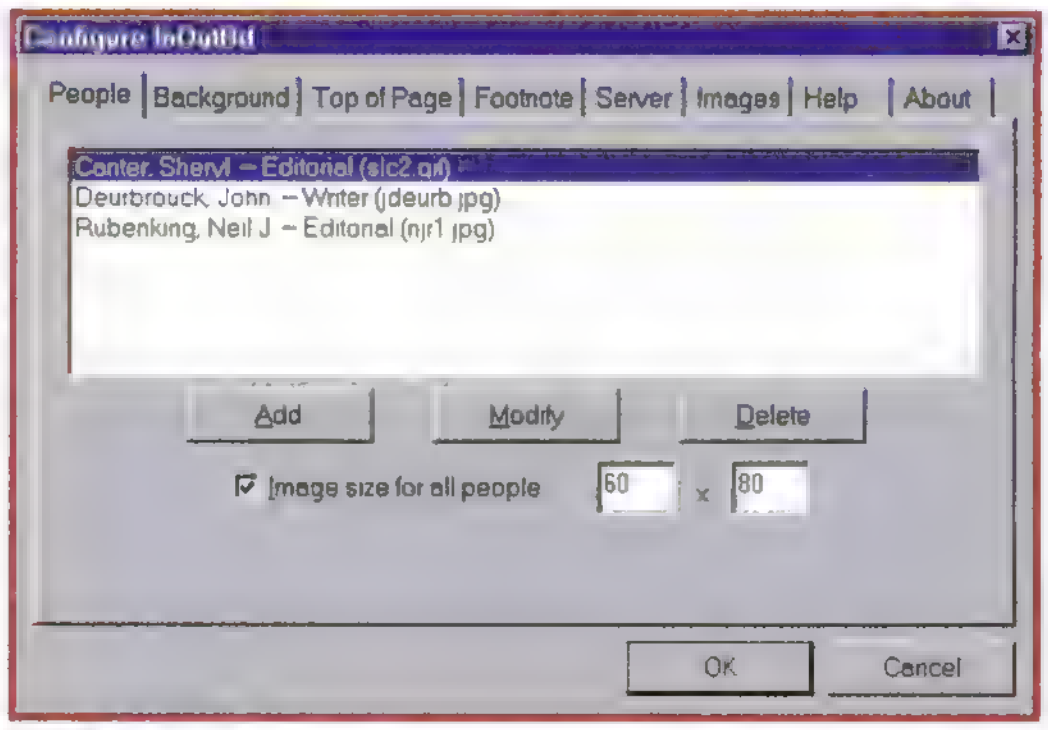

FIGURE 2: *InOutBd's configuration dialog is where you enter the list of employees whose whereabouts you want to track.*

CUSTOMIZING THE DISPLAY

I mentioned earlier that you can change the InOutBd display by altering the header and the hotlink to which it points. You can also change the background wallpaper and add a footnote. These controls are in InOutBd's configuration dialog box, shown in Figure 2.

Click the *Background* tab to change the background settings. You can choose from three options: the built-in background image, a background color (almost 200 choices), or a tiled background image using one of the bitmaps in your image directory.

Choose the *Top of Page* tab to change the heading at the top of the report pages (Figure 5). The built-in image says, "Keeping Current with InOutBoard" and has a *PC Magazine* logo. You may also select any image from the image directory. If you do so, you should use the *Size* check box to specify the size of the image. This will speed up the page display in the same way that checking the *Image size* check box on the *People* tab does. By default, the image at the top of the page is a clickable link that will take the user to *www.pcmag.com*. You can change the URL by typing a new one in the edit box, or you can disable the link entirely by unchecking the *URL* check box.

The Footnote page consists of a *Use footnote* check box and an edit box for entering plain text or HTML. If you know HTML, you can make your footnote as fancy as you like, including images, hotlinks to connect to other department pages, and a counter. The footnote will be displayed at the bottom of both the main page and the Detail pages.

Note that for security reasons, you are strictly limited in the files you can serve to clients. First, you can serve only JPEG and GIF files. All other file requests are ignored. Second, the files must be in the image directory specified on the Image page of the configuration dialog. Third, you must reference these images using a standard syntax:

```
/images/filename.typ
```

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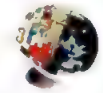

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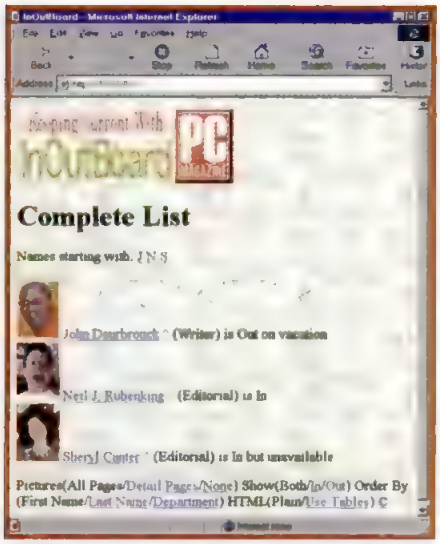

FIGURE 3: *When you access the InOutBd server with a browser, the initial display is the main InOutBd in plain-text format.*

where *filename* is the name of the JPEG or GIF file you want to display, and *typ* is either JPEG or GIF. Note that these are forward slashes, and you *cannot* use the actual path where the file is stored; you must use the standard image directory name "/images/". For security reasons, InOutBd disallows the use of standard DOS syntax for specifying paths.

SERVER SETTINGS

Click the *Server* tab on the configuration dialog box for the last set of options. An edit box on this page lets you set the number of lines of data in the InOutBd scroll buffer. This controls how much data is stored for the screen display.

The Server page is also where you can specify the port on which InOutBd operates. What is a port? Well, for a Web browser to find a Web server (such as InOutBd), it must know the machine to contact and the port at which the server is listening. Only one program can listen to any particular port at one time. By default, all Web servers (including InOutBd) use port 80.

Normally you will want to use the default port, but there are two situations in which you might want to change it. Many firewalls work by limiting access to certain ports, so if your company has a firewall, you may need to change the port number to allow users access through the Internet. If you use a port other than 80, then users accessing the server must add a colon and the port number to the end of the URL for the server. For example, if you changed the port to 115, the URL might be: *http://207.95.65.151:115*.

The other reason you might want to change the port is to *discourage* access from the outside. A nonstandard port will be virtually impossible to guess.

INOUTBD AND SECURITY

You may have security concerns about running a program such as InOutBd, which has the ability to connect to outside computers. But you need not worry. InOutBd was deliberately designed to be a very limited-function Web server. It does serve up data files, but only JPEG and GIF files. If a request comes for a file that is not in the directory that you (as the server administrator) have specified for image files, the request is simply ignored. If a request comes for a file and the request contains a colon (:) or backslash character (\), the request is ignored. If a request comes for a file that does not have the extension .JPG or .GIF, the request is ignored. InOutBd cannot write to your disk at any time, except when you manually save the .IOB file. In/out status changes are stored in memory until the administrator saves the file. InOutBd has been carefully designed to serve up only the data it is supposed to, and it cannot be used to obtain other files. It will not allow outsiders to look at your hard disk or erase any files.

WRITING INOUTBD

Most people are aware of *HTTP* (HyperText Transfer Protocol) as a prefix for Internet addresses on the Web. In fact, HTTP describes how Web browsers request and receive data from servers. In a simple HTTP transaction, a client contacts a server with a request, and the server responds, possibly returning data to the client. InOutBd is a special-purpose Web server, so to understand its design you must first understand HTTP.

There are many different commands that browsers can use to communicate with a server. Of these, only `GET` is of interest to InOutBd. The `GET` method allows the requesting Web browser to ask for a specific bit of content. In its simplest form, it consists of the keyword `GET`, the name of the item requested, and optionally the HTTP version number (1.0 or 1.1). When the request is received by an HTTP server such as InOutBd, the data to be returned is gathered together and then sent in a block to the client. Once all the data is sent, the connection is closed.

Let's look at the request for a single page, the display in Figure 4. The server responds to a `GET` request by sending the HTML code for the requested address. (You can see the HTML code for any Web page by selecting the *view source* option in your browser.) The display you see in Figure 4 is rather complex, with text, pictures, and background pattern. Yet the HTML source for this page is just 648 characters. It contains only the text you see on the Web page, plus filename references for the background image, the header picture, and the employee picture. After receiving the HTML code, the Web browser will request each of these elements in three separate `GET` requests. The image dimensions are in the HTML code because they were specified in InOutBd's configuration dialog box. This lets the browser display the page before receiving the images.

In summary, the simplest sort of Web server sits and waits for connection requests to come in on a particular port (by default, port 80). When a connection request comes in, it is accepted and the data constituting the request is read from the port. Then the data answering the request is sent out to the client, and the port can be safely closed. How is this done in MFC? Let's look at some code for one example.

HANDLING HTTP WITH MFC

WinSock, or Windows Sockets, is the communications API used for TCP/IP programming under Windows. A *socket* is simply a named endpoint in communication—for example, your computer. The IP address of your computer and the port number it's using constitute the name of the "socket" that others on the TCP/IP network can "plug into" if they want to communicate with you.

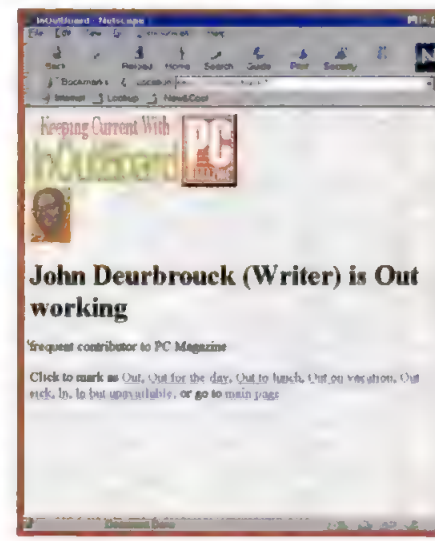

FIGURE 4: *If you click on an employee's name, you get the Detail page for that employee. This is where you can change the in/out status.*

InOutBd uses a document class called `CInOutBdDoc` to store all the program's data—for example, the list of employee names and employees' in/out statuses. Two different

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classes handle communications with the outside world: `CListenSocket` and `CRequestSocket`. Each of these is derived from the MFC class `CAsyncSocket`.

`CAsyncSocket` is a handy little piece of work. You simply create a socket object and set it to listen, and it will handle incoming data without further intervention. Internally, it starts a new thread for each socket, but you needn't concern yourself with that. It will terminate the thread if you delete the socket, so cleanup is conveniently automatic.

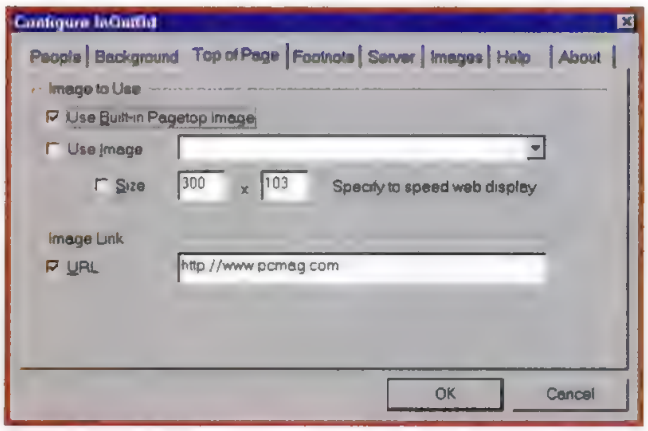

FIGURE 5: *The Top of Page settings let you change the heading at the top of the display. You can make the heading into a hotlink that will launch the URL of your choice.*

First, the server must start listening to a port so it can handle incoming requests. This is done by a call to `CInOutBdDoc`'s `StartListening` function, which creates a `CListenSocket` object on the heap and then calls the inherited `CAsyncSocket` member functions `Create` and `Listen`. Once this is done, a connection request from a Web browser results in a call to `CListenSocket::OnAccept`, which responds by accepting the connection and creating a `CRequestSocket` object to handle it. `CRequestSocket` holds descriptive information about the client, including the IP address, and also holds the input and output buffers for client requests. If the connection is accepted by the server, the server tells the new socket to respond to `READ` and `CLOSE` notifications.

The first action of the `CRequestSocket` object is to read all the data in the incoming request. For servers doing complex work, this can be difficult. But for InOutBd, it's simple. All the requests it receives come from users clicking hotlinks in a browser page served up by InOutBd. These requests are never more than a few bytes, so all reads take place in a single call. When the InOutBd server receives the data it requested from the browser, it calls the virtual function `OnReceive`, which is overridden in `CRequestSocket`.

`CRequestSocket`'s `OnReceive` method reads the data in the request, then stores the data in the input buffer, `mInbuf`. It then calls the WinSock function `GetPeerName` to get the address of the browser making the request—the socket on the other end of the connection. When the request is for a database update (for example, a user changing status from out to in), this lets the document object report the IP address of the machine requesting the update in the InOutBd user interface. Finally, the `CRequestSocket` object calls `ProcessRequest`, a member function of the document object, to satisfy the browser's request.

It's the responsibility of the document object to generate the data requested by the client Web browser. If the request is for a report (a page of information including data from the database), the document object will send out the page's description in HTML. Note that a request to update the database is considered a report, because the browser display must be changed to reflect the update. If the request is for a data file referenced in the HTML, then the document object will place the actual data into the output buffer.

The document object allocates space for the data and sets the number of bytes to send, and the `CRequestSocket` object frees the allocated space when the data is no longer needed. If the requested data is internal and statically allocated (like the built-in wallpaper image), the document object sets a negative number of bytes, indicating that the `CRequestSocket` should not attempt to free the space.

When the data to be sent out has been generated and `ProcessRequest` has returned, the `CRequestSocket`'s `OnReceive` method calls its `OnSend` method to start sending data. `OnSend` is responsible for beginning the transmission, sending the data, and deleting the `CRequestSocket` object after the object is no longer needed.

Some Web servers require much more sophisticated services than InOutBd. But for simple requests with simple responses, the `CAsyncSocket` provided by MFC requires very little assistance in providing excellent service. I hope you find InOutBd useful. Don't forget that you can run multiple copies to serve different groups of users. And if you're calling in over phone lines, turn off the graphics before you worry about it being too slow!

John Deurbrouck is a longtime Windows programmer and a frequent contributor to PC Magazine. *Sheryl Canter is the editor of the Utilities column and a contributing editor of* PC Magazine.

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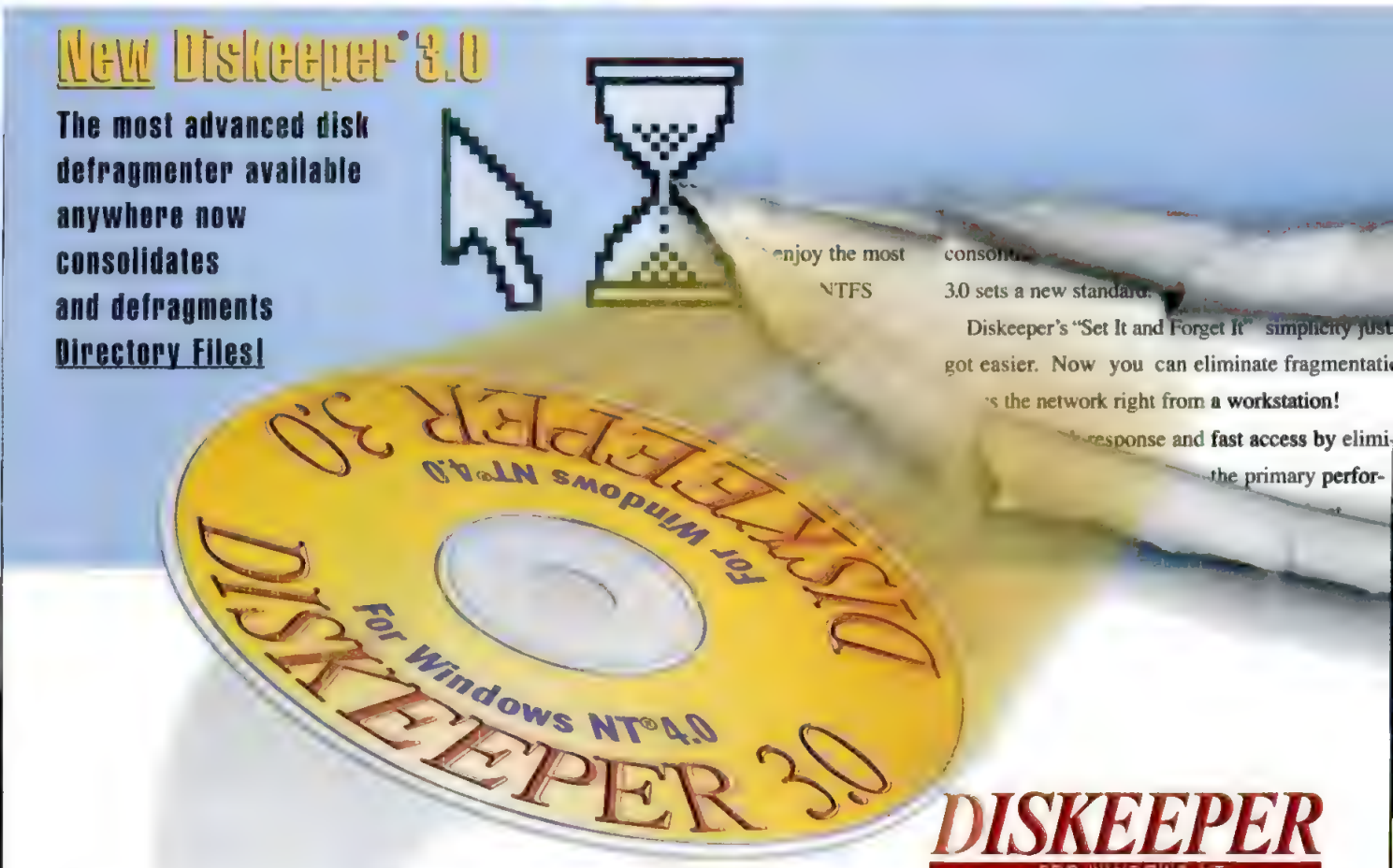

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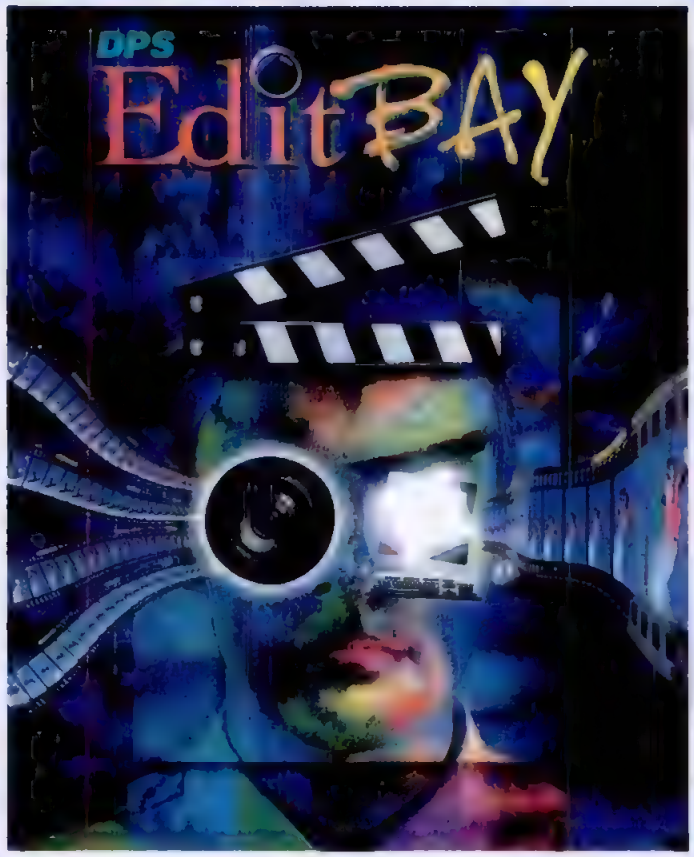

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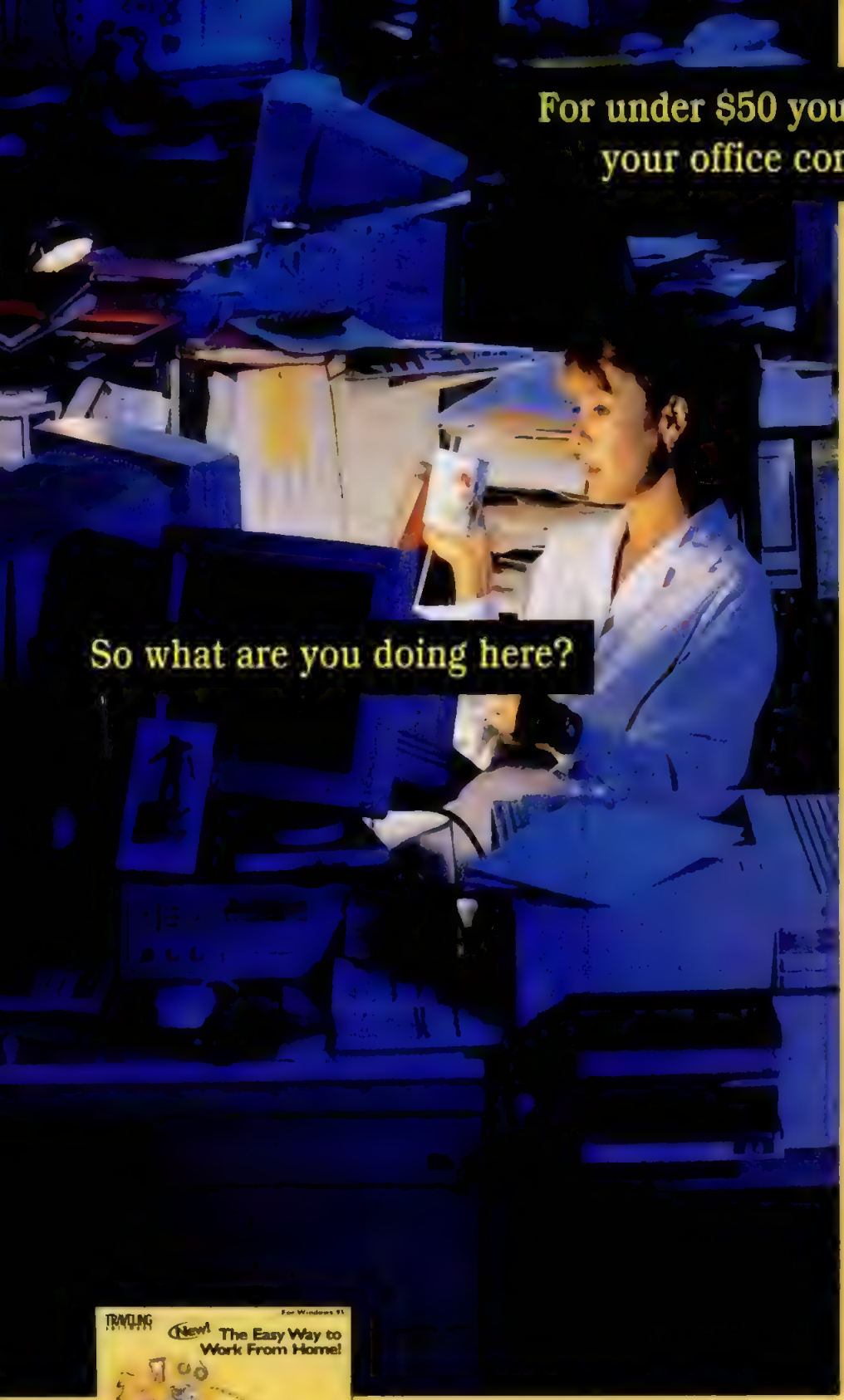

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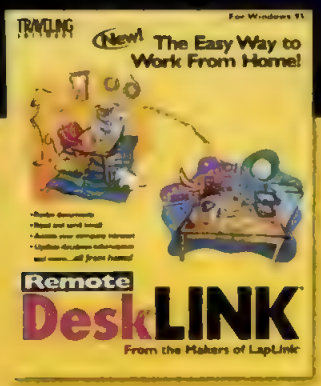

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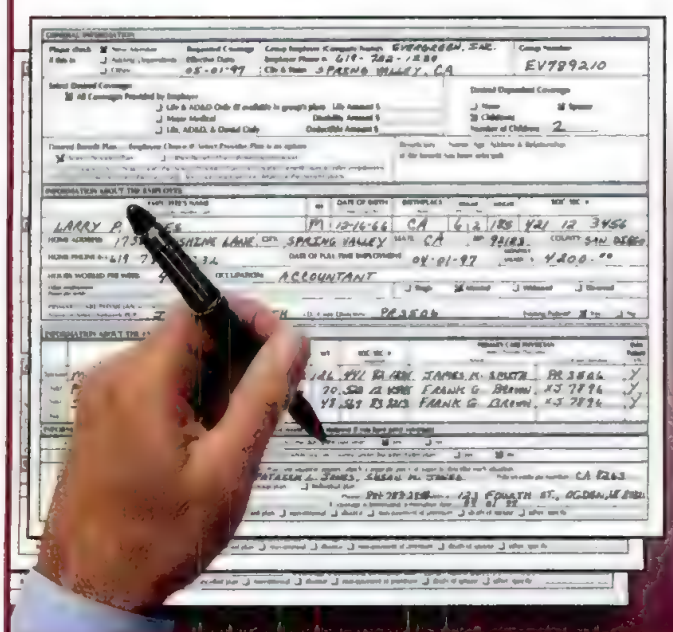

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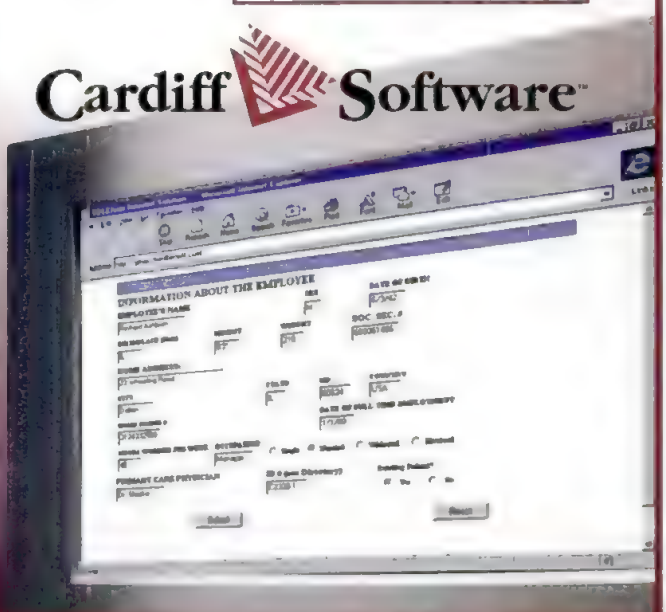

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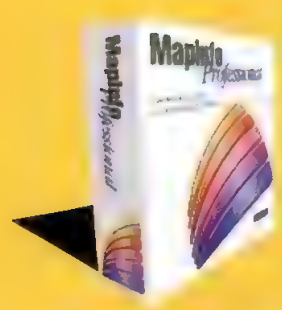

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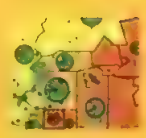

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– Windows Sources, June 1997

"Tops Norton's Utilities"
– PC Magazine, June 24, 1997

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– PC World, July 1997

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Provides Detailed System Info	YES	YES
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Crash Protection	YES	—
Easy System Configuration	YES	YES
Zip/Unzip files	YES	—
Zip Integrated with file and Hard Drive Cleanup	YES	—
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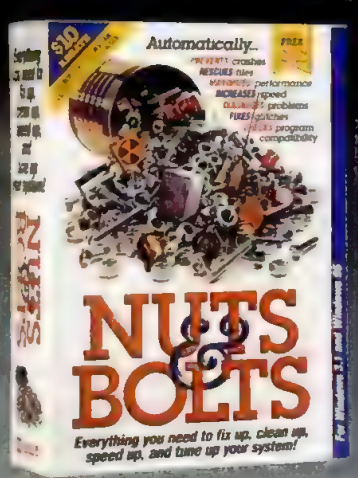

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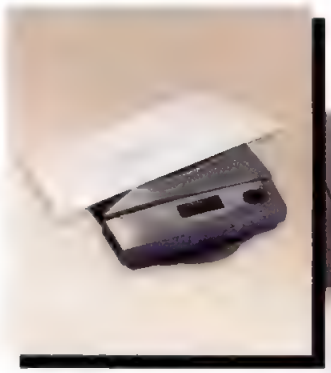

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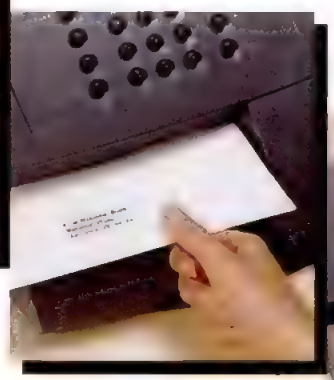

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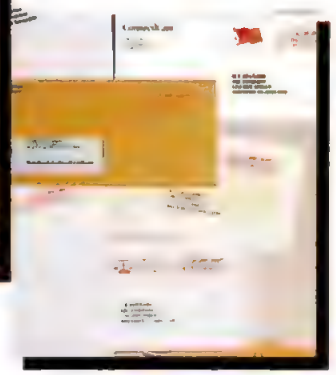

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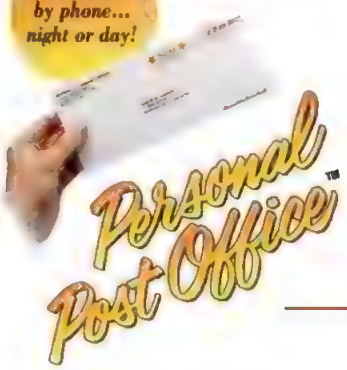

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ser-to-User

BY NEIL J. RUBENKING

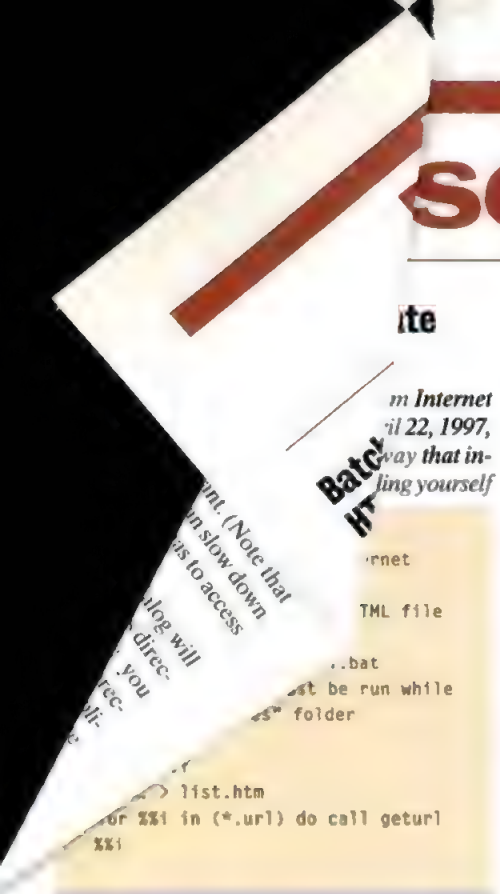

FIGURE 1: *Run this batch file from the Favorites folder to create an HTML document containing links to your Favorites.*

a message. Here's another method using the two batch files, Makeht.bat (Figure 1) and Geturl.bat (Figure 2), that do most of the work for you. These two files should be stored in and run from the Favorites folder, within the Windows folder.

When you run the batch files, the List.htm file that results has one flaw. Each URL line begins with URL=, and it shouldn't. In order to fix this problem, open List.htm in your favorite text editor. Search for URL= and replace it with nothing.

CAMERON CLARK
Sour Lake, Texas

PC MAGAZINE: Makeht.bat initializes the output file and calls Geturl.bat for each .URL file in the Favorites folder. Geturl.bat builds an HTML string from the data in the .URL file and appends it to the output file. Typically, a batch file will build a text file for output by using the ECHO command and appending each ECHOed line to the output file using the >> redirection symbol. The problem here is that HTML tags contain the < and > symbols, which would be interpreted as redirection symbols in the batch file.

The solution used in Geturl.bat relies on the fact that the PROMPT command has metastrings that represent the redirection symbols, $G for > and $L for <. To append a line to the output file, Geturl.bat builds a dummy batch file containing nothing but a PROMPT command that defines the desired line. Then it runs that batch file under a secondary command processor and appends the command processor's output to the output file. The output consists solely of the prompt itself. It's a roundabout way to write a line, but it works!

There's no easy way to automate the process of removing "URL=" from the beginning of the URL lines. Since you need to edit the List.htm file anyway, you may prefer the alternate Geturl .bat shown in Figure 3, as it is faster. After using this batch file, you have three editing tasks: replace URL= with nothing, replace left curly bracket ({) with the less-than sign (<), and replace right curly bracket (}) with the greater-than sign (>).

```
@echo off
:: create the following five lines
::   (parenthesized words are not literals)
::
::  <A HREF="
::  (actual URL)
::  ">
::  (long file name of the *.url file)
::  </A> <BR>

echo @prompt $1A HREF=">   dummy.bat
command /C dummy.bat   >>  list.htm
type %1 | find  "URL=" >> list.htm
echo @prompt "$g  > dummy.bat
command /C dummy.bat >> list.htm
dir /b %1 >> list.htm
echo @prompt $1/A$g $1BR$g > dummy.bat
command /C dummy.bat >> list.htm
:: clean up
del dummy.bat
```

FIGURE 2: *This batch file builds HTML tags defining one link and appends them to the output document.*

Watching the Boot Process

In the November 4, 1997, Ask Our Advisors column, you suggested eliminating the Windows start-up logo in order to view the progress of AUTOEXEC.BAT and CONFIG.SYS at boot-up. You gave some really good advice, but there are two easier ways to watch the two files run.

The first (and easiest) is this: When the start-up logo appears, hit the Esc key. This gets rid of the logo, and you can then observe the boot process. The second way is to press F8 as soon as you see "Starting Windows 95" on your screen, then select step-by-step boot. The latter method is probably the best, because you actually have time to read each command as it executes.

TIM GERNERT
Fort Hood, Texas

```
@echo off
:: alternate version of
GETURL.BAT
::  after running, edit LIST.HTM
and replace
::    URL=      with nothing
::    {         with <
::    }         with >

echo {A HREF=">>list.htm
find  "URL=" < %1 >> list.htm
echo "}>>list.htm
dir /b %1 >> list.htm
echo {/A} {BR}>>list.htm
```

FIGURE 3: *This version of Geturl.bat works more quickly and simply, but the output requires a little more editing.*

PC MAGAZINE: It's amazing how many readers wrote in to point out these alternative methods for viewing the progress (and problems) of the boot process. My own preference is to eliminate the boot-up logo, as described in my earlier response, so that if something does go wrong I'll see it immediately. If you'd rather see the boot-up logo most of the time and skip it only when something goes wrong, you can definitely use step-by-step confirmation. As noted, you'll watch for the words "Starting Windows 95..." to appear and immediately press F8, then select *Step-by-step confirmation* from the Windows 95 start-up menu.

You'll be given many yes/no choices, starting with whether or not to load the DoubleSpace driver and whether to process the system registry. Be sure you answer yes (Enter) to these two essential items! In fact, unless you're absolutely sure that a given line in CONFIG.SYS or AUTOEXEC.BAT should be omitted, answer yes to everything.

I can't wholeheartedly recommend pressing Esc to hide the boot-up logo. Some readers have reported that the Esc keystroke can "fall through" to the program or driver that's loading. And if you use the step-by-step confirmation option, you'll definitely have a chance to see the process, because the system pauses before each line.

Ask Our Advis

HARDWARE

Recording CD Sound to Your Hard Disk

I have a sound card and a CD-ROM drive. Is there any way that I can play a music CD and record to the hard disk at the same time without the external mike having to pick up the recording? This would be similar to having a stereo with two cassette decks, where you can record from one onto the other without any background noise. If this requires a special utility, please let me know.

MONICA MCDONALD
Grand Saline, Texas

PC MAGAZINE: If you can play an audio CD in your CD-ROM drive and have the sound come out your computer's speakers, you are probably all set. All you have to do is start a sound-recording utility and play the audio CD. There are a few important considerations to keep in mind, however.

First, there's the question of which program you'll use. You can use the Windows Sound Recorder, but it defaults to a maximum 60-second recording limit. You can trick it to record a longer period of time (insert Wave files to reach the desired length, and then record over it), but you'll be better-off if you use a more flexible recording utility; your sound card may have come bundled with one.

The other important issue is the sound quality. A standard audio CD is recorded at a 44.1-KHz sampling rate, which means that more than 44,000 data samples are taken per second. A stereo recording with two channels will have twice as many samples as a monaural recording. The samples are 16-bit, which means that 2 bytes will be required for every sample; and 44,100 samples per second times two channels times 2 bytes per sample adds up to more than 176,000 bytes of data . . . per second. A minute of this will consume more than 10MB of your hard disk's capacity.

You can reduce the amount of storage required for a recording by reducing the sampling rate (which reduces the frequency response) or the sample size (which reduces the dynamic range of the recording) or by switching to a single channel, monaural recording, but it won't sound the same as the original.

So if you're just looking to grab some short sections from your favorite CDs to spice up your Windows sound effects, you shouldn't have any problems. If you're looking to duplicate the contents of a CD on your hard disk, then you may need to make a sizable investment in additional storage capacity.
—Alfred Poor

OPERATING ENVIRONMENTS

TrueType Fonts in OS/2

I run both Windows 95 and OS/2, using Boot Manager to switch between them. I just installed some neat new TrueType fonts under Windows 95. OS/2 Warp 4 is supposed to support TrueType fonts, but they don't show up when I try to select a font in my word processor. How can I get OS/2 to recognize the new fonts?

ADAM ZURICH
via the Internet

PC MAGAZINE: If you installed Warp 4 after Windows 95, it should have looked for any TrueType fonts you were already using under Windows. But when you add new fonts, you need to let OS/2 know where they are. Click on the OS/2 Warp logo in the Warpcenter, then *OS/2 System*, then *System Setup*, and finally *Font Palette*. When the palette is open, click on the *Edit Font* button.

From the font-editing dialog, click on the *Add* button and you will be asked to enter the path to the new font. Most Windows 95 fonts can be found in C:\Windows\Fonts, so try that first. Some third-party programs put their fonts in C:\Windows\System, so you might look there as well. O path and clicked on screen will resemble the the located TrueType fon

As you click on a filena will appear in the dialog on t select as many fonts as you w having a lot of fonts installed the boot process, because OS/2 each font file during start-up.)

By default, the bottom of the contain a path pointing to the Psfon tory on the OS/2 boot drive. Sinc already have the font in the Windows tory, though, you don't need to have a du cate in the OS/2 directory. Just change t path to the location where you found the font, and OS/2 will link to it there. When you click on the *Add* button, the font will be registered with OS/2.

Note, though, that the new font won't appear in the Edit Font dialog right away. If you want to add it to the Font Palette (which isn't necessary to access the font from your word processor) you will need to close the Edit Font dialog, then click on the *Edit Font* button again.—*Brian Proffit*

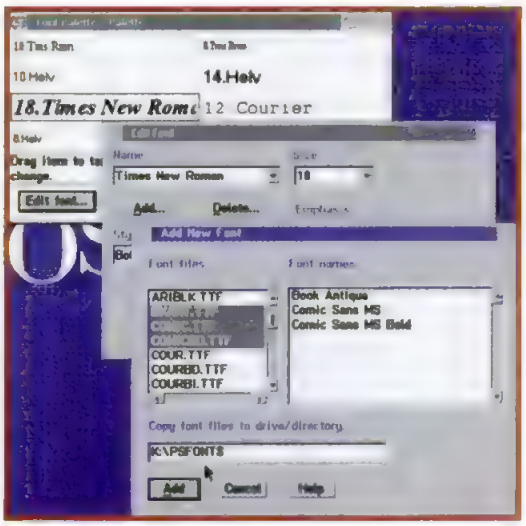

FIGURE 1: *Adding TrueType fonts to an OS/2 system.*

OUR ADVISORS

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Luisa Simone *is a contributing editor and the author of* Microsoft Publisher by Design.

Craig Stinson *is a contributing editor and the coauthor of* Running Windows 3.1 *and* Running Microsoft Excel.

M. David Stone *is a contributing editor and the coauthor of* Word for Windows Companion, *Second Edition.*

WORD PROCESSING

Alignment Characters for WordPerfect Tabs

In Corel WordPerfect 7, there's an option for tabs that doesn't seem to do what it promises. If you choose Format | Line | Tab Set *to open the Tab Set dialog box, you'll find a section in the lower right-hand corner of the dialog box labeled* Align Character, *with a text box labeled* Character. *This seems to mean that you can define something besides a period—or decimal point if you prefer—as an alignment character for tabs.*

I needed a dash as an alignment character but couldn't get it to work. In fact, I couldn't get WordPerfect to recognize any character other than a period as an alignment character, and WordPerfect technical support couldn't help. Does the Align Character *entry serve some other purpose that I'm missing?*

JAMES YOUNGLOVE
via the Internet

PC MAGAZINE: The align character does exactly what it promises to do. However, there is a trick to making it work with a hyphen, and the problems you ran into with the hyphen probably led you astray in trying to make it work with other characters.

The first step in getting the align character to work is to realize that it will work only with a decimal tab or a dot decimal tab, which adds a leader character to the line in front of the tab. It's easy to miss that point, since you can set the *Align Character* option even when the dialog box is set for left-, center-, or right-aligned tabs.

The easiest approach to entering an align character code in WordPerfect 7 is to enter it at the same time you define the decimal tab. Choose *Format | Line | Tab Set* to open the Tab Set dialog box. You might want to start by choosing *Clear All* to remove all the current tabs. Then set the type to decimal, set the position, enter the character for the align character, and choose *OK* to insert the codes and return to the document.

If you hit Alt-F3 at this point to reveal codes, you'll see a `[Tab Set]` code, which defines the position and alignment for the tab, and a `[Dec/Algn]` code, which defines the alignment character. Start with your cursor to the right of the codes, then hit Tab, and you'll be able to enter text, using whatever alignment character you chose.

Hyphens are a special case for the align character, because WordPerfect offers several kinds of hyphens. If you simply type the hyphen key, you'll get a `[-Hyphen]` code, which tells WordPerfect that it can break the word at the hyphen if it falls near the end of the line. However, WordPerfect does not recognize `[-Hyphen]` as a hyphen for an alignment character. To enter a hyphen for decimal tab alignment, you have to enter a hard hyphen (Ctrl-<Hyphen> on the CUA keyboard). Word wrap won't break a word like *1-2-3* if you use hard hyphens. However, WordPerfect will recognize a hard hyphen as an align character.

Note that once you define a decimal alignment character, WordPerfect will use that character until you define a replacement. So if you want to use, say, hyphens in one part of a file and decimal points elsewhere, you'll need to redefine the alignment character.

You can redefine the character as many times as you like. That means you can, for example, align a column on the left side of the page using an equal sign and a column on the right side using a decimal point. Having to redefine the align character twice on each line, however, is a chore. For that sort of task, you would probably find it worthwhile to record macros to redefine the alignment character and place them on the toolbar for handy use.

An alternative for this kind of format is to use a table instead of decimal tabs. If you define a table with four columns, you can format the first and third columns for right alignment, format the second and fourth columns for left alignment, and adjust the margins within the columns to eliminate space between text in the first and second columns and between text in the third and fourth columns. The table itself will then control alignment with any characters. For the finishing touch, define the table so the grid lines don't show. The result will be visually indistinguishable from using decimal tabs and the alignment characters of your choice.—*M. David Stone*

SPREADSHEETS

Excluding Hidden Cells when Copying

I have been working with very large Excel spreadsheets containing several thousand rows of information extracted from accounting data files. I run several sets of nested subtotals, then collapse the resulting outline so that only rows with subtotals appear.

My problem is that I would like to copy all of these subtotal rows to other worksheets for manipulation, but no matter how I try this, all of the hidden rows between the subtotal rows get copied, too.

Is there an easy way to copy only the non-hidden rows on a spreadsheet?

PHIL CETRONE
via the Internet

PC MAGAZINE: Yes. Ordinarily, when you select a range that includes hidden cells, Excel includes the hidden cells as well as the visible ones in your selection. Here's how you can get around that problem:

1. Select the range of cells you're interested in.
2. Choose *Go To* from the Edit menu (or press F5).
3. Click the *Special* button.
4. Choose the *Visible Cells Only* option and click *OK*.

You can simplify the task by putting the Visible Cells tool on one of your toolbars. To do that in Excel 97, follow these steps:

1. Right-click any visible toolbar and choose the *Customize* command.
2. Click the *Commands* tab, choose the *Edit* category, and then scroll down the command list until you come to *Select Visible Cells* (it's the next-to-last item in the list).
3. Select that item and drag it to a toolbar.
4. Click *Close*.

Before using the tool, of course, you still have to select the range you're interested in. The tool (or its equivalent option in the Paste Special dialog box) refines your selection to exclude any hidden cells.—*Craig Stinson*

DATABASES

Protecting Access Code and Objects, Revisited

You don't have to use the Access Developer's Toolkit (ADT) to protect the code and design of objects in Microsoft Access 2. I am a Visual Basic and Access application developer, and I routinely secure my code and design without using ADT. If you're interested in obtaining the detailed steps, please refer to Microsoft Knowledge Base article Q132143.

STEPHEN WANG
via the Internet

PC MAGAZINE: A number of readers took the time to write regarding the topic of securing Access code and design from accidental (or not so accidental) alteration by users. In our issue of June 24, 1997, I recommended using the Microsoft Access Developer's Toolkit to distribute a secure, encrypted application.

There is, however, another way to accomplish this, as many of you pointed out. You can use Access's built-in user-level security to protect your database and assign

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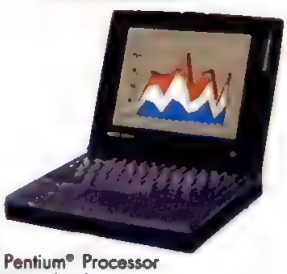

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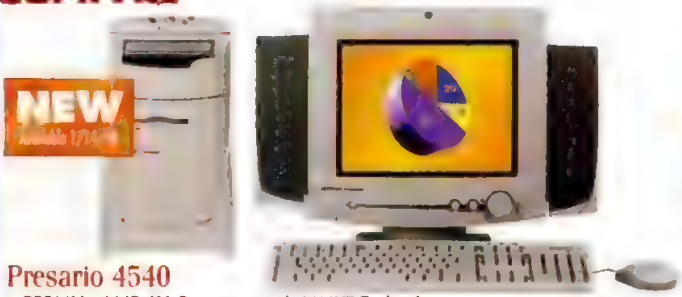

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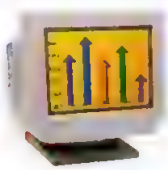

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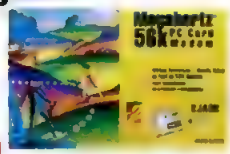

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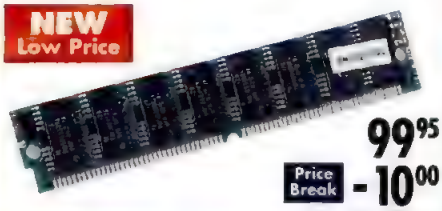

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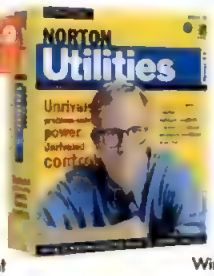

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selected access rights and permissions to users. This approach requires that you have a thorough understanding of the Access security model and of how Access uses workgroups, accounts, ownership, and permissions to secure a database.

User and group definitions reside in the system database, so you will have to distribute a carefully configured System.mda with your application's database. If you must use a user's existing system database, you need to configure it carefully with the appropriate user and group definitions. The permissions for database objects are stored in system tables in the application database. When a user logs on, Access verifies the user against the information stored in the system database, then looks up the object permissions for that user in the application database and proceeds to enforce them.

This approach does not strip away your source code from the database and relies on the accurate placement and configuration of the system database. Because the source code is there, the potential always exists that someone will figure out how to access it. In the case of a secured database, this could require as little as figuring out the password for the Admin account (or the MyAdmin account, which many people use instead).

The best approach to securing your code and the design of your forms and reports is to upgrade to Access 97 and use an MDE file, which is a special version of your database where the source code has been stripped away. To protect your tables and other objects, you can add the user-level security discussed here prior to converting your database to an MDE file. This requires you to maintain two versions of your database—the one with the code and the one without—if you ever plan to make changes to the code or design. You make the changes to the unstripped database and then generate a new MDE file.

If you're going to implement user-level security in Access 2.0, you should download the Access Security Wizard and use it. You can download it from *support.microsoft.com/support/kb/articles/Q122/0/36.asp*. For Access 95 and Access 97, the security wizard is already under *Tools | Security*.

The Knowledge Base article mentioned by Mr. Wang provides instruction on how to secure your database in Access 2.0 and can be downloaded from *support.microsoft.com/support/kb/articles/Q132/1/43.asp*.

More information on Access security can be found in *Building Applications*, the documentation provided with the Version 2.0 ADT and with Microsoft Office 97, Developer's Edition. A useful collection of frequently asked questions on Access security for all shipping versions is in Secfaq.exe, which can be downloaded from *support.microsoft.com/support/kb/articles/Q165/0/09.asp*.

—Sal Ricciardi

ONLINE

Adding an Outlook Contact List to Mail List Choices

When I give the command in Outlook to write a new message and choose the To . . . *or* Cc . . . *button in the Message window, the only names I see are the ones in the Personal Address Book. According to the Outlook help file, I should be able to add the names in my Contact folder to the choices by first selecting the Contact folder in the folder list, then choosing* File | Folder | Properties *and* Outlook Address Book, *and adding a check to the check box labeled* Show this folder as an e-mail Address Book. *When I try that, however, the choice is grayed out. Is there another setting somewhere that I need to know about?*

SIMON PEARY
via the Internet

PC MAGAZINE: The help screen you found doesn't mention an important step. Before you can set a Contact folder to show up as an e-mail Address Book, in effect you have to tell Outlook that it's okay to use Outlook Contact folders for e-mail addresses.

To make sure Outlook can take advantage of the Contact folders for e-mail, load Outlook using whatever profile you normally use, and choose *Tools | Services* to open the Services dialog box. You should see an assortment of services, typically including Internet Mail and Personal Address Book. If you don't see Outlook Address Book in the list, choose the *Add* button to open the Add Service to Profile dialog box.

One of the choices you should see as an available information service is *Outlook Address Book*. Highlight it, then choose *OK*. Outlook will install the new service, then warn you that the service will not start until the next time you load Outlook. Choose *OK*, close the dialog box, and close Outlook. Restart Outlook. You should find that if you select the Contact folder and choose *File | Folder | Properties*, then *Outlook Address Book*, the *Show this folder as an e-mail Address Book* check box will be available. If you have more than one Contact folder, you can select each one in turn and set the properties for each separately.

Once you've defined more than one list for e-mail addresses, you'll have to pick the list you want as needed. When you choose the *To . . .* or *Cc . . .* button in the Message window, Outlook will open the Select Names dialog box. You can choose which list to use in the list box labeled *Show Names from the*, just under the title bar.

If you have just the Personal Address Book and one Outlook Address Book named Contacts, for example, your choices will be *Personal Address Book*, *Outlook Address Book*, and *Contacts*, with *Outlook Address Book* functioning as a heading and *Contacts* indented underneath it. If you have more than one Contact folder defined for e-mail, they will all show under the *Outlook Address Book* heading.

Finally, be aware of two sources of possible confusion. If you've added the Outlook Address Book service but haven't defined any Contact folders to show as e-mail address books, you'll see *Outlook Address Book* as a choice in the Select Names dialog box, but if you choose it, you won't see a list of names. Instead, you'll see the statement, "No entries in this Address Book." Keep in mind that this is a heading, not the name of a list.

Second, whatever address book you choose in the *Show Names from the* box, you will see only those names with e-mail addresses. If you don't see a name you're looking for, return to the Outlook main window, find the name in the list, double-click on it to look at the full contact record, and make sure there's a properly formatted e-mail address. If necessary, retype the address and choose *File | Close*. The name should now show up in the list you get when working in the Message window.—*M. David Stone*

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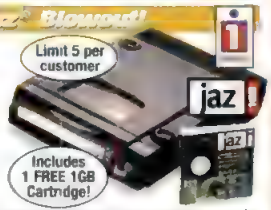

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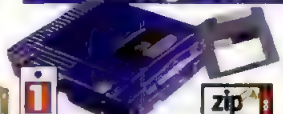

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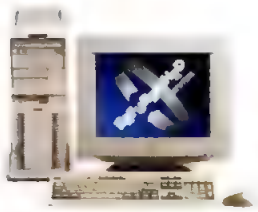

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2GB 12.1" AM	$2939.38
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2.1GB 12.1" AM	$1639.87
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2.1GB 12.1" AM	$3259.66
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7730MT 166/MMX 32MB	
2.1GB 12.1" AM	$3279.65
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2.1GB 12.1" AM	$3449.58
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3GB 12.1" AM 20X	
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Logitech PageScan Color Parallel	99.95
[illegible]	145.34
[illegible]	284.34
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NEC MultiSync E1100 21" 0.28mm	1218.46
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5000ECX	233MHz Pentium MMX	32MB	3.1GB	20X	56K bps	$3[illegible]	100876
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1960CS[1]	166MHz Pentium MMX	16MB	2.1GB	20X	33.6K bps	$1939.77	95153
1965CT[2]	200MHz Pentium MMX	16MB	2.1GB	10X	33.6K bps	$2399.98	95156
1970CT[2]	233MHz Pentium MMX	48MB	3.1GB	20X	33.6K bps	$2879.13	100113
2010CX[3]	166MHz Pentium MMX	32MB	2.1GB	20X	33.6K bps	$2919.57	95158
2020CX[3]	200MHz Pentium MMX	32MB	2.1GB	20X	33.6K bps	$2979.87	95150
2030CX[3]	200MHz Pentium MMX	48MB	3.1GB	16X	33.6K bps	$3129.16	95151
2040CX[3]	233MHz Pentium MMX	80MB	3.1GB	20X	33.6K bps	$3379.51	101079
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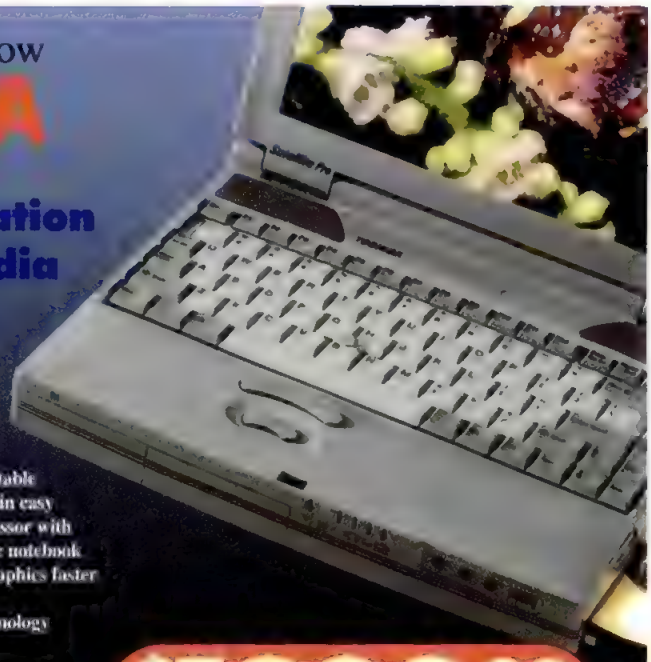

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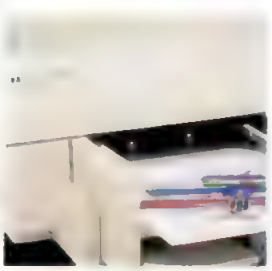

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3.3V	*64Meg*	*249*	*329*
3.3V	*128Meg*	*599*	*749*
3.3V	*256Meg*	*1296*	*1439*

INDUSTRY STANDARD DIMMS

Unbuffered	16Mg	32Mg	64Mg	128Mg	256Mg
3.3V ECC, EDO	72	120	240	573	—
3.3V EDO	60	100	200	—	—
5.0V EDO	74	124	300	719	—
5.0V FPM	74	125	235	729	—
Buffered					
3.3V ECC, EDO	72	120	240	573	1200
3.3V ECC, FPM	60	100	200	240	1020
5.0V ECC, FPM	90	150	400	675	2000

72 PIN SIMMS (FPM, EDO)

	8MB	16MB	32MB
1 x 32 4 mg	15	15	15
2 x 32 8 mg	25	25	25
4 x 32 16 mg	40	40	40
8 x 32 32 mg	80	80	80
16 x 32 64 mg	190	190	190
1 x 32 4 mg EDO	15	15	15
2 x 32 8 mg EDO	21	21	21
4 x 32 16 mg EDO	30	30	30
8 x 32 32 mg EDO	70	70	70
16x32 64 mg EDO	180	180	180
256 x 36	14	-	
512 x 36	14	-	
256 x 32	8	-	
512 x 32	9	-	
1 x 36 4 mg	24	24	24
2 x 36 8 mg	34	34	34
4 x 36 16 mg	84	84	84
8 x 36 32 mg	184	184	184
16 x 36 64 mg	240	240	240

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64Kx8	-	15.00 /64K	-	-
128Kx8	29.50	26.00	24.00	

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1Meg x4 (Zip Pkg)	-	-	-	12.00	11.00
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G6-Prof M MMedia System EDO	4Meg 8Meg 16Meg 32Meg	17/32 49/94
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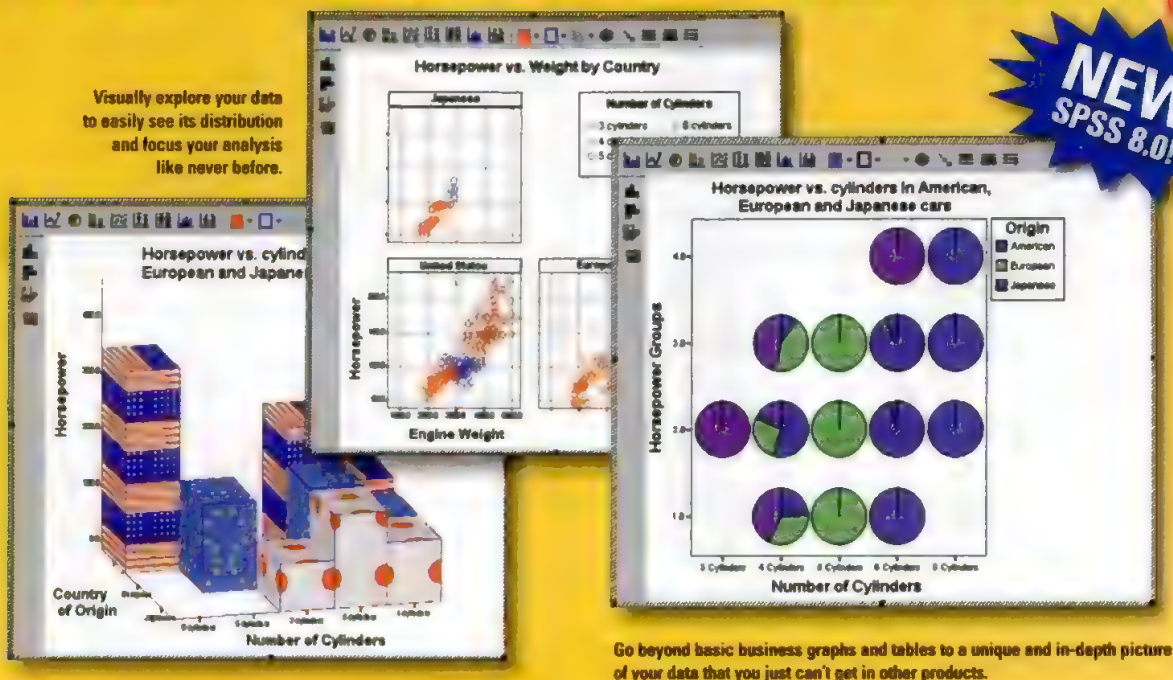

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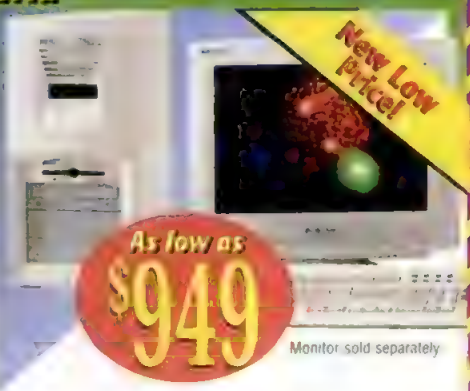

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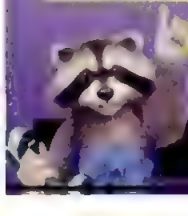

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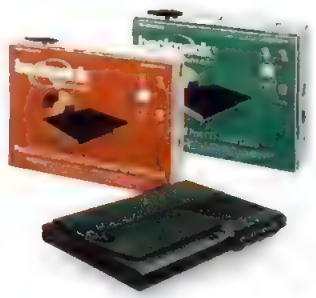

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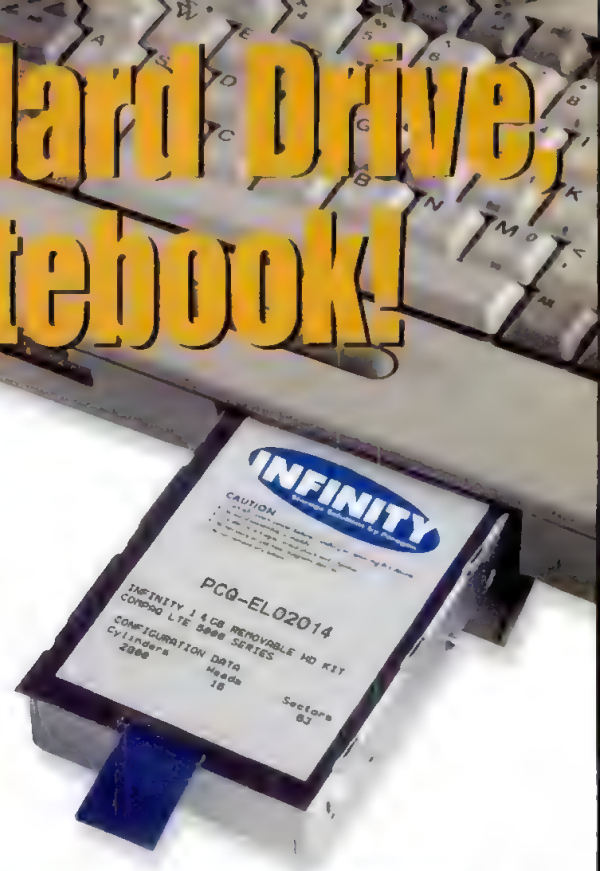

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3228MB	5400	Quantum	FB33240S	$258
4310MB	5400	Quantum	FB34320S	$307
4330MB	5400	IBM	IBM34330N	$329
4360MB	7200	Western Digital	WD4360N	$499
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4360MB	7200	Western Digital	WD4360W	$549
4550MB	7200	Seagate	ST34555W	$389
4550MB	7200	Seagate	ST34572W	$499
4550MB	7200	Quantum	VK34555W	$429
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2620MB	5400	Fujitsu	MPJ3026U	$169
3200MB	5400	Fujitsu	MPJ3032U	$179
3227MB	4500	Seagate	ST33232A	$192
3228MB	5400	Quantum	FB33240A	$185
3240MB	5200	Maxtor	M83240D	$189
3249MB	5200	Western Digital	AC23200	$182
4318MB	4000	Quantum	BF4000A	$241
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24X	NEC	CDR1800	95	$86
24X	Mitsumi	CRMCFX24X	90	$85
24X	Toshiba	XM6102B	85	$88
32X	Teac	CD532E	84	$110
32X	Toshiba	XM6202B	80	$119
32X	NEC	CDR1900	80	$120

IDE CD CHANGERS

Speed	Brand	Model	# Disks	Int
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16X	Nakamichi	MJS16A	5	$149

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SCSI CD ROM

Speed	Brand	Model	ms	Int
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20X	Plextor	PX20TS	95	$195
24X	NEC	CDR1810	85	$139
32X	Toshiba	Xm6201B	85	$159
32X	Teac	CD532S	85	$149
32X	Plextor	PX32TS (caddy)	85	$229
32X	Plextor	PX32CS (caddy)	85	$269

SCSI CD CHANGERS

Speed	Brand	Model	# Disks	Price
16X	Nakamichi	MJS16	5	$239
SCSI CD TOWERS			4 Drive	7 Drive
16X	NEC	100ms	$599	$1079
20X	Plextor	95ms	$1139	$2019
24X	NEC	85ms	$799	$1399
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Nakamichi 16X		150ms	$1349	$2349
Ethernet 7 CD TOWERS			10-T	100-T
16X	NEC	100ms	$1829	$2029
20X	Plextor	95ms	$2769	$2969
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24-48GB	DDS-3 DAT 12MB/min, C5648A	$2699

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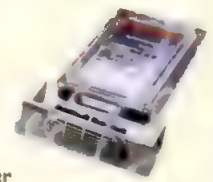

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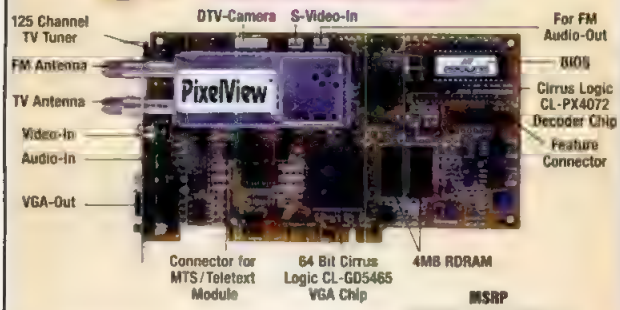

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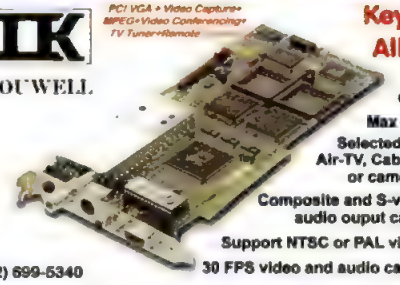

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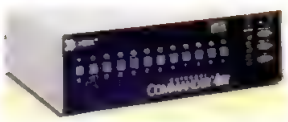

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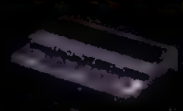

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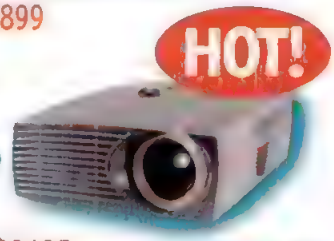

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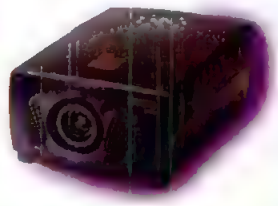

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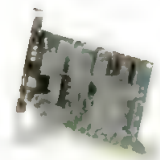

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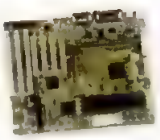

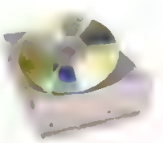

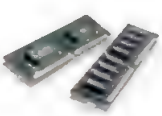

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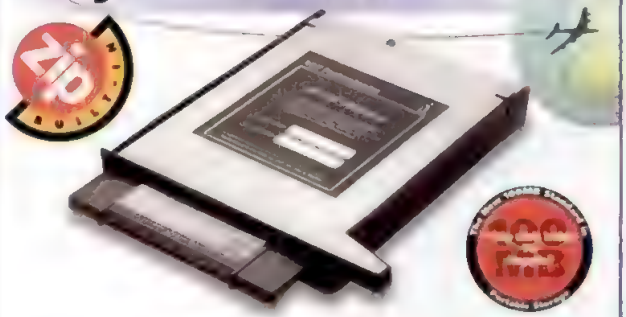

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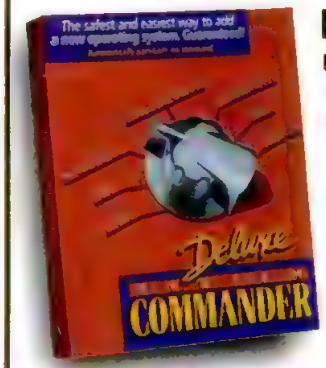

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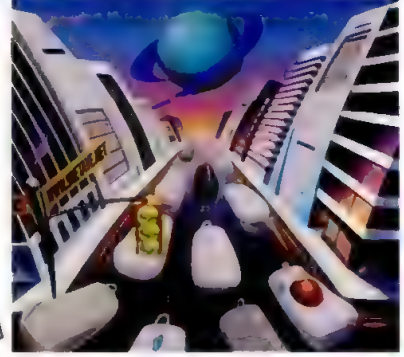

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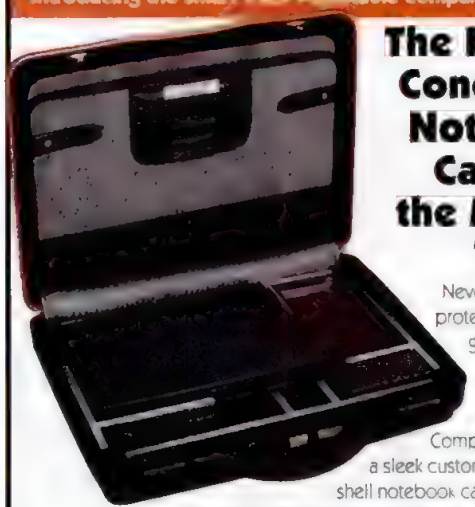

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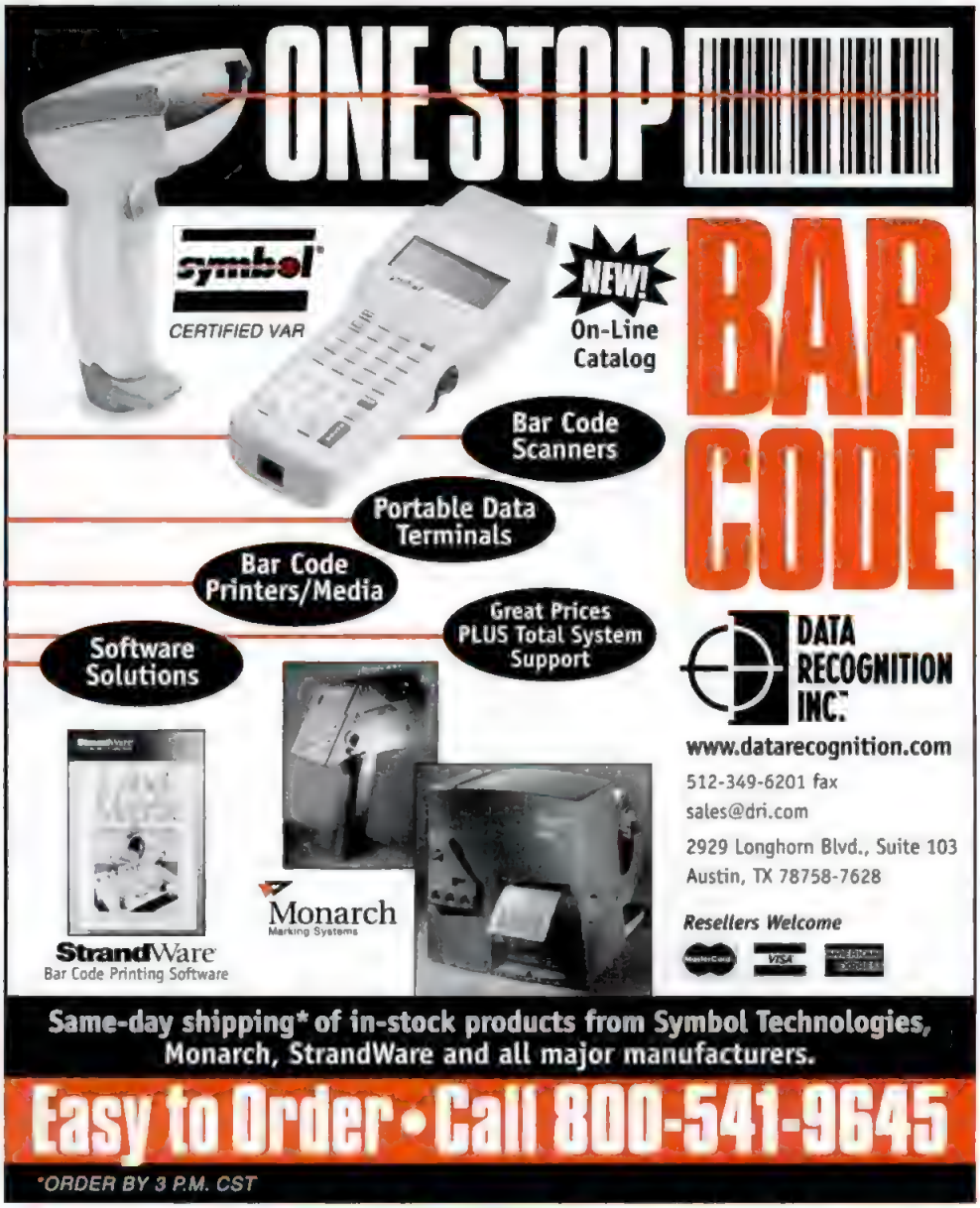

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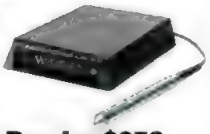

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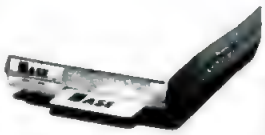

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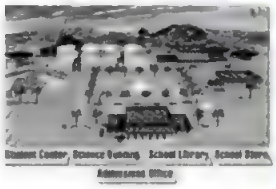

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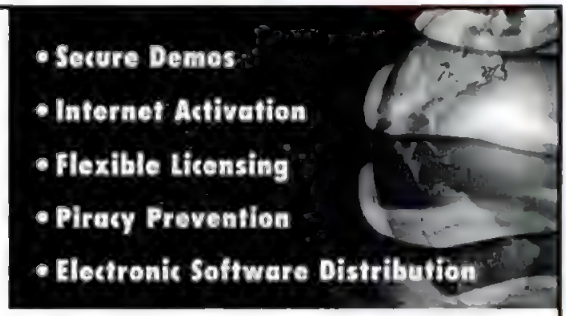

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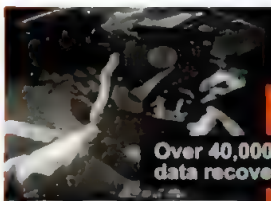
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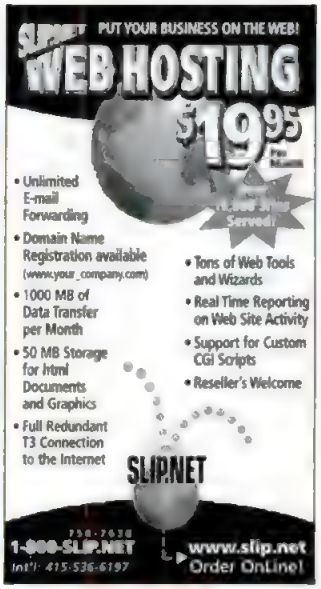

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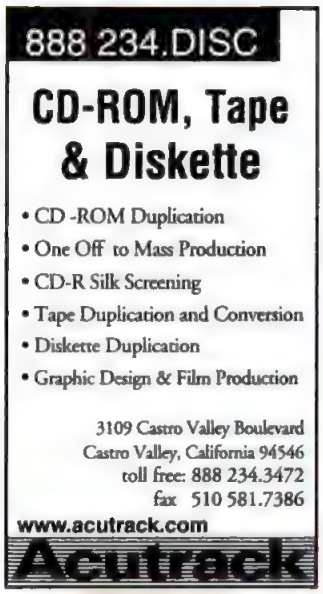

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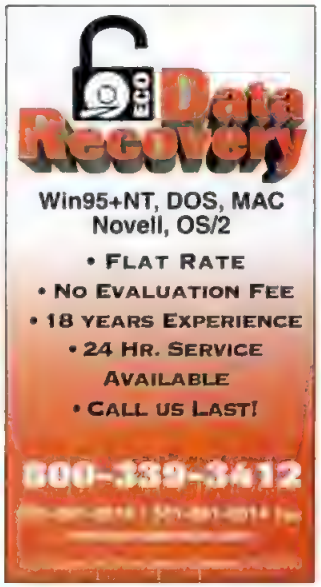

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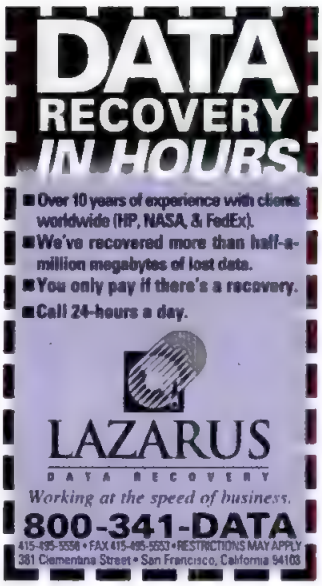

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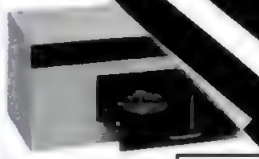

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After Hours

Wonder Years

Five new programs to educate and stimulate kids 3 years old and under.

By Teri Robinson

The latest spate of learning programs are aimed at children in their first three years of life, which many pediatricians consider the true wonder years. The five toddler titles we reviewed can help lay the foundation for growth during these important initial years.

Most of the programs will capture the imaginations of your 1- and 2-year-olds and provide them with solid educational building blocks. Kids who have passed their third birthdays may find some of the activities too basic and lose interest. The exceptions to this are the two "Sesame Street" programs, which are created for 2- to 4-year-olds.

Fisher-Price Ready for School Toddler

Fisher-Price creates some of the most popular toys on the market today. In Davidson & Associates Fisher-Price Ready for School Toddler, the company trots out some truly beloved characters: The Little People.

This ethnically diverse group of cuties leads your toddlers through ten activities. Before getting started, they select from two difficulty levels, then click on one of the Little People on the main screen to step into a game.

In Telephone Talk, Joe the Policeman and other Little People replace numbers on the nine oversize buttons of a "plastic" phone. Click on a button and your children's new friends tell a bit about themselves. Children also watch for messages from Spot, which can appear at any time during play, and record messages in response.

An activity called My First Things helps toddlers recognize different objects. Kids lead a Little People character through a maze to articles such as a shoe or a book. At the first level, the maze is a simple path. At Level 2, the maze is more complex; children are asked to listen carefully and identify the object that John has lost.

Davidson also includes a traditional educational tool, The Little People Toddler Workbook.

Perhaps 3-year-olds will tire of the activities in this title quicker than younger kids, but the two-level system makes the program more stimulating for older toddlers than a title like Reading Rabbit's Toddler.

JumpStart Toddlers

Knowledge Adventure has an extensive collection of software titles aimed at youth markets, from its newest JumpStart Baby title (for the 6- to 24-month-old set) to JumpStart Spanish.

JumpStart Toddlers, like all of the company's titles, was developed with input from teachers and child psychologists. No doubt all their contributions account for the colorful animation and tunes catchy enough to hold your toddler's interest. Older children can easily navigate JumpStart using the button bar at the bottom of the screen, but it takes parental involvement for kids age 2 and younger to get the most out of the program's eight activities.

Giggles the Gopher will delight your children as he leads them through the letters of the alphabet. A picture accompanies each letter to help kids make associations. Children can also develop prereading skills by participating in a word-recognition game that links spoken words with their written forms. JumpStart Toddlers introduces over 200 words to your child's vocabulary.

A memory game hides a bevy of friendly characters and kooky sounds that younger toddlers will enjoy discovering, and the sing-along section features bright songs penned by children's musician Bethie.

INSIDE

A WHOLE NEW YOU
Cosmopolitan Virtual Makeover lets you play hairstylist—no scissors required. *Page 340*

FANTASYLAND
Lands of Lore: Guardians of Destiny drops you into a mystical land. *Page 344*

WWII REVISITED
This impressive strategy game does anything but bomb. *Page 344*

A KING'S GAME
From opening move to checkmate, Chessmaster 5500 is the one to beat. *Page 348*

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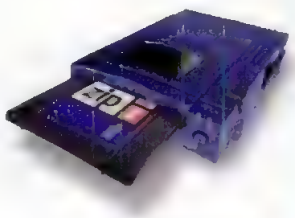

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Knowledge Adventure recommends JumpStart Toddlers for children from 18 months to 3 years old, but the program is best suited for those under 2 and a half.

Reader Rabbit Toddler

The Learning Company's Reader Rabbit Toddler touches on all the basics. The company's literature says the title is appropriate for 18-month to 3-year-old children who have limited realms of experience and motor skills. But thanks to TV, videos, and computers, the average child's frame of reference probably is a bit more expanded than The Learning Company acknowledges in this educational title.

The program is built around eight fun activities, including the Follow-Me Theater, the Musical Meadow, the Peekaboo Zoo, and the Bubble Castle. Though each activity encourages the use of a mouse, none requires mouse clicking—an option older, click-happy children may miss.

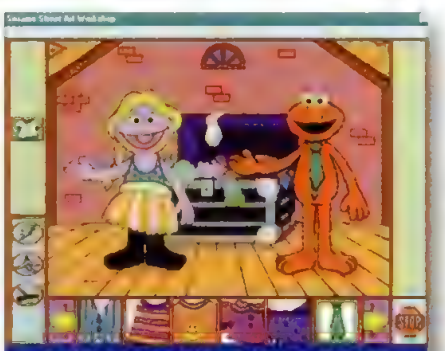
Led by Mat the Mouse, children select an activity, and parents click on a button that details the skills their toddlers will develop using the Reader Rabbit title. One disappointment: Reader Rabbit is scarcely seen. The Peekaboo Zoo helps children recognize animals by the sounds they make, and the Bubble Castle encourages them to count.

The program includes a parents' handbook that offers tips for encouraging your child's development. While Reader Rabbit Toddler covers the basics, 3-year-olds aren't likely to find this material a challenge. In this program, the lengthy list of educational resources and experts the vendor consulted while developing the title can't make up for some unmistakable shortcomings.

Sesame Street: Learning Series Toddlers Deluxe

Come and play, everything's A-OK, with Sesame Street: Learning Series Toddlers Deluxe, from the Children's Television Workshop and Creative Wonders. This three-CD set, with its 30 activities, doesn't skimp on educational resources, creativity, or fun.

Not only do many of your children's favorite "Sesame Street" friends check in, but as your children move the cursor down the street, "sparkles" appear over any object that they can interact with.


SESAME STREET: LEARNING SERIES TODDLERS DELUXE
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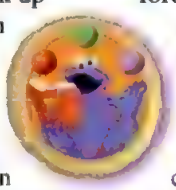
The first disk is home to an Art Workshop with more than 50 art projects, ranging from stickers to costumes; the latter project offers 12 scenes in which kids can dress their favorite characters. And if kids need extra help, Elmo is there to lead them through.

Disk Two, Letters, helps your children hone prereading skills. Letters and words are hidden in every corner, from Big Bird's nest to Bert and Ernie's home. Even King Oscar's garbage turns into a treasure trove. As your children help Oscar pick up the trash, they match items to letters.



A third disk offers eight activities to prepare your children for math. In the Present Game, for instance, they help Elmo fill a package with the number of items he wants.

Sesame Street: Learning Series Toddlers Deluxe is billed as a learning tool for children from 2 to 4 years old, but its appeal should last a long time after age 4.

Sesame Street: Reading Is Fun Toddler Edition

After using Sesame Street: Reading Is Fun Toddler Edition, your child will be hooked on reading. In this program, Cookie Monster—decked out in a silk robe and lounging in an easy chair—hosts "Monsterpiece Theatre."

Your children's trusted Muppet pals offer their takes on two classics in this two-CD set. Toddlers can have the stories read to them or strike out on their own, playing matching, counting, and finding games and interacting with an assortment of characters.

"The Three Grouchketeers" follows the travails of Telly, Zoe, and Grover as they

SESAME STREET: READING IS FUN TODDLER EDITION
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try to find the Royal Pig and return it to King Arthur before the Mud Ball begins. To make a ramp for scaling a wall, for instance, young ones must match shapes. Early on, children collect royal junk at King Oscar's castle and, in a clever twist, must put that junk to good use to save the Royal Pig from a mucky doom.

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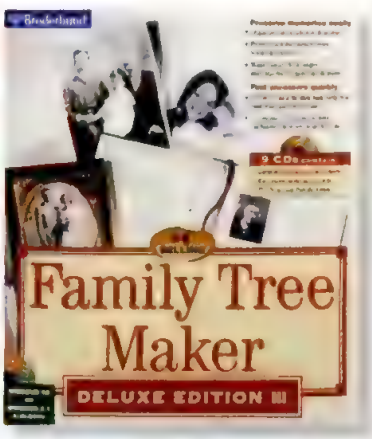

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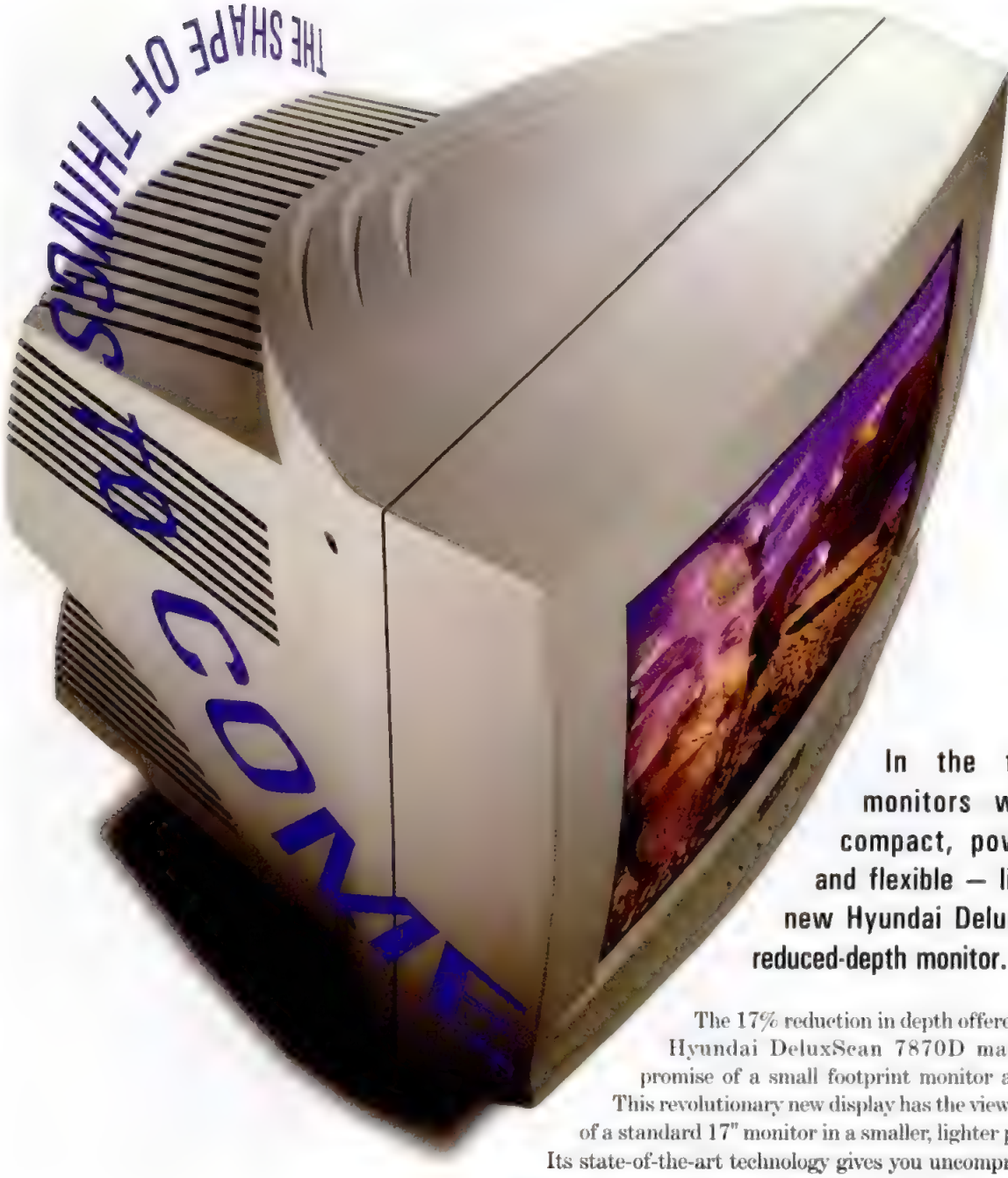

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With Cosmopolitan Virtual Makeover, you'll discover a whole new you.

A trip to the hair salon can be as nerve-wracking as a trip to the dentist: You want that new look or the in do but worry about whether it will look good on you. Fret no more. With Cosmopolitan Virtual Makeover, salon nightmares are a thing of the past. Alone or with a bunch of friends, you can test hairstyles, hair colors, makeup, and even eye color all on your computer screen. The program, which was made in association with *Cosmopolitan* magazine, won't replace a consultation with a professional stylist. What it does offer is a fun—and sometimes funny—look at different incarnations of you.

The $40 street price can save you aggravation and a few bucks: You won't have to waste money on products that don't work for you. With the program, you have the ability to sample virtual makeup and hairstyles.

There's no doubt that Virtual Makeover focuses on the fairer sex, but men have some styling options too. The program offers both professional and casual hairdos for men, as well as beard and mustache choices.

To get started, you'll need a photo of yourself from the shoulders up, sans makeup. You can take a regular photo and scan it, snap a shot with a digital camera, or have someone put your image on a Photo CD (many 1-hour photo shops do this). If you don't have access to any of these options or just can't bear the thought of being photographed without makeup, you can use one of the models included in the program.

Once your image is on-screen, palette options can be sorted into two categories: hair and makeup. Hair options include hairstyles, highlights, and eyebrows, and the makeup section features blush, foundation, and eye shadow. Thrown in for good measure is an eye-color option.

In the hair section, new coifs are simply a click away. We found this module the most fun and beneficial. There are 150 different hairstyles to choose from. You'll find styles ranging from a chic, upswept look or a face-framing bob to a just-for-fun beehive hairdo.

Hairstyles are divided into three categories: short, medium, and long. Color choices are blonde, auburn, brown, and black. Within each color, you can adjust the tone—from reddish-brown to flaming red, for example. The drawback of this module is that you can't modify the style further by adding bangs or changing the part to the other side.

The eyebrow feature allows you to add, remove, or change the color of your eyebrows without making mistakes that take months to repair. Unfortunately, while you are working in the eyebrow module, you temporarily lose the hairstyle you've chosen and can't see the total effect until you return to the main menu. This kind of annoyance also occurred in other modules.

After you select a hairstyle, you can try on different samples of makeup such as foundation, blush, eye shadow, and lipstick. You can create a shopping list of all the products you selected (the makeup palette consists of Cover Girl–brand cosmetics only). Along with the selection of makeup colors are application tips. The advice is pretty solid, but applying makeup by using the cross-hair–target cursor was a bit difficult.

We were also disappointed by the zoom feature: You can zoom in on your image only when you're adjusting your on-screen eyebrows. And you can't expand the image to full-screen.

We found Virtual Makeover useful for those who are interested in trying out new hairstyles but don't quite have the nerve to walk into a salon and say, "Okay, cut it all off." The makeup aspects of the disk, however, do nothing to beautify the program.—*Diane Jecker*

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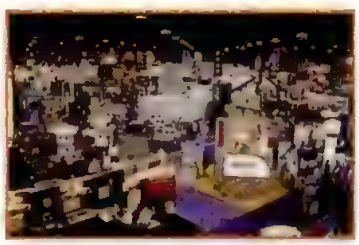

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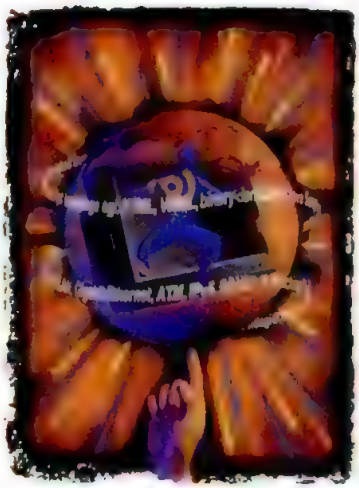

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LANDS OF LORE: GUARDIANS OF DESTINY
★★★☆☆ $45 street. Westwood Studios, 800-874-4607, www.westwood.com.

The past 12 months have proven to be "the year of the long-awaited sequel," with several successful games finally being reborn. And after four years, we now have the sequel to Lands of Lore. The long wait for Lands of Lore: Guardians of Destiny has given us time to build up our expectations, and although it's an engaging game, this sequel falls victim to its own procrastination. The game feels dated.

Guardians of Destiny runs on a Pentium/75 and requires 16MB of RAM. You're cast in the role of Luther, son of Scotia. Before her untimely death, your sorceress mother willed to you her morphing ability, which has somehow gone horribly awry. Without warning, you transform from a slavering monstrosity to a Chihuahua-size lizard. This could be a cool talent, but since you have no control over it, it can be a burden. Your first quest is to rid yourself of the curse.

What you don't realize is that you're about to become involved in a universal dilemma. The executed god Belial has arranged for a magical beast to resurrect him, and you're soon thrown into the middle of the conspiracy.

As you wend through some 20 levels of mysticism and mayhem, you romp through caves, jungles, and ancient ruins. More DOOM than Myst, the graphics are disappointing—not surprising in a game that is four years old. Pixelization and jerky character movement are commonplace.

Lacking state-of-the-art graphics isn't necessarily a death knell. The story is quite compelling. And though you have plenty of weapons and magic spells, the game isn't the mindless slayathon one might expect. You fight (albeit awkwardly) only when necessary.

Still, although Guardians of Destiny has some strong features, it's not a game that'll keep you up past your bedtime. With worthy contenders like Riven competing for your gaming dollar, it's likely that the latest Lands of Lore will remain unexplored.—*Shane Mooney*

A Five-Star General

The battlefields of WWII are revisited in this impressive strategy game.

PANZER GENERAL II
★★★★★ $45 street. Strategic Simulations Inc., 800-601-7529, www.ssionline.com.

The German tanks, Soviet planes, British troops, and American army: All the elements that made Panzer General a top-notch World War II strategy game are back—in Panzer General II. And as we began to play, we were delighted to realize that they are even better the second time around. Though the new version maintains enough of the feel of the original that Panzer General fans should have no problem adjusting, it is very much its own game—and a brilliant one at that.

Running on a Pentium/90 with 16MB of RAM and using 25MB of hard disk space, the game is not a resource hog. On starting the game, you'll notice much-improved graphics. Photo-realistic detail shows in battlefield damage, 3-D tanks, and other artillery units. But great graphics alone do not a great game make, and SSI has devoted plenty of effort to revving up game play.

Artificial intelligence has been dramatically enhanced; enemy units adopt different styles of fighting, depending on your tactics. They've even "learned" not to leave their backsides exposed when they make a hasty retreat.

But that's just the tip of the iceberg. Along with 5 new military campaigns, 30 hand-rendered maps, and turn-by-turn playback, there's also a wonderful Scenario Builder for creating your own battle scenes. As if that isn't enough, there are 12 scenarios designed specifically for multiplayer game play. And we don't mean the e-mail variety or the kind of play you get only while playing on TEN (Total Entertainment Network, an online gaming service); this is true LAN- and Internet-based play.

So what's wrong with the game? Not much, except perhaps that since the title appeals so thoroughly to true war gamers, casual strategy gamers will probably pass it by for the latest non-turn-based game. But for those from the board-game old school, Panzer General II may be the title of the year.—*Shane Mooney*

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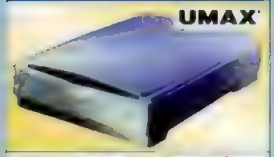

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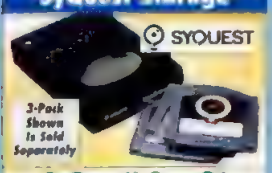

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Whether you're a novice or an adept player, the game is sure to educate and stimulate. To start, you assess your ability on a scale ranging from beginner to expert. You can also set your opponent in the game to mimic a real-life international chess master like Josh Waitzkin (the subject of the movie *Searching for Bobby Fischer* and your on-screen host).

Audio and animated help abound in this game. For instance, a new Info Voice feature proves helpful for explaining the functions of menu choices. The Natural Language Advice option diagnoses your play; it will consider all possible moves for you and even play out the game on-screen for you to see. Although this multimedia spin on help is entertaining and useful, we were just as satisfied with the text-based Coach. This feature outlines the effect each move can have on the game: it might produce a pin, a check, or even a mate.

True aficionados will appreciate the chance to employ famous openings and defenses in their own games, and beginners should view the three tutorials that introduce the pieces, their movements, and basic strategies. But the Visual Thinking window, with its graphical analysis of all the moves Chessmaster is considering, seems unnecessary.

Chessmaster 5500 is visually pleasing, with polished graphics and a variety of 2-D and 3-D board designs to choose from. The game requires a Pentium/90 and 16MB of RAM; play was generally smooth on our Pentium/133 system with 16MB, but we did notice some lag time when pulling down menu options.

The Chessmaster Live feature gives you access to online play over the Internet. The online players might be welcome now and then, but with Chessmaster 5500, you'll never grow bored playing against the machine.—*Bertrand C. Emmett*

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Coming Up

What's in the Next Issue of *PC Magazine*

Personal Finances Online

We survey the personal finance landscape, beginning with a face-off between the latest versions of Money and Quicken; and we include a good look at their online portions. We also review the leading multipurpose finance Web sites and specialized sites, and we round up this year's crop of tax packages and show how they integrate changes in the law for 1997 filings.

High-End Workstations

PC Magazine Labs puts a mix of *x*86 and non-*x*86 systems through rigorous benchmark and applications testing. These $10,000 to $20,000 systems come with high-end graphics cards and large monitors typical of CAD and high-end graphics rendering work.

Discussion Software

More and more businesses are discovering that online discussion areas create interest, help user communities cohere, and provide a good way of fielding questions. We review packages that get you up and running with threaded or linear discussions.

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DVD With Internet And PR200 PC!

DVD Is The World's BEST Video And Audio!

A new age of home entertainment is here—new PC Cinema from Tiger. This remarkable new device combines a powerful 6x86 PC—including Internet access—with the latest in video technology: *the DVD player*. DVD (for Digital Versatile Disc) holds massive amounts of information—like movies in multiple languages, multiple director's cuts and more. And that's just the beginning. What PC Cinema does is combine every entertainment device you have now—into one unit. Imagine sitting in your living room and surfing the Intenet—then switching to the integrated Windows 95 PC and playing a few levels of Myst or Terry Bradshaw's football (on CD-ROM, which can be played on your DVD player). Then, another click of your remote (or wireless keyboard, included) and diving into the latest movie release on DVD—with the world's best audio and video quality. You can even combine activities—like watching a movie while finishing up a spreadsheet—all while lounging on the sofa!

Hollywood's blockbuster hits are **now available in superior-quality DVD format!**

DVD Is The Best In Sight And Sound... DVD is the next generation for movies—delivering true theater quality sight and sound right into your home. Plus, the new Dolby digital sound blows the doors off anything you've ever heard.

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A13-PCC1	IBM 6x86 PR-200 PC Cinema	$999.99
A13-PCC2	AMD K6-233 MMX PC Cinema	$1399.99

PR200, P233 PCs: FROM $499.99

AMD-K6 MMX, IBM 6x86MX, Pentium MMX. Easy-To-Assemble!

You can assemble a brand new multimedia 200 or 233 powerhouse and save up to $300! Choose just the right processor for your kind of work from the best in the industry... a Pentium MMX... or the AMD-K6 MMX... or the IBM 6x86MX. These are complete kits, easily assembled for a full-featured multimedia system. Simply choose the hard disk size you need and a monitor for a ready-to-run system. Is it easy? YES! In fact, you need only a screwdriver and about an hour—it's easier to assemble than that barbeque on your patio! You'll actually enjoy assembling this computer—and learn about how it works in the process. Our state-of-the-art motherboard, high-speed SDRAM memory and floppy drive are all pre-installed and 100% tested. Plus, the kit includes a top-speed 24X CD-ROM drive or NEC 4-CD Changer, 56K BOCA Research faxmodem with voice, 16-bit 3D Stereo Sound, S3 ViRGE 3D video with 4MB of video memory, premium Windows 95 keyboard, PS/2 mouse, stereo speakers, microphone, cables and more.

Tiger's top-of-the-line 233 and Pentium II models also include a Microsoft IntelliMouse that makes scrolling on the Internet faster and easier than ever. Plus, these powerhouses come with our finest AT or ATX motherboards (shown above), which support the newest EIDE Ultra DMA/33 hard disks. These new hard disks boost transfer rates twice the previous 16MB/second limit—up to 33MB per second! We highly recommend teaming up a new Ultra DMA/33 hard disk with these fantastic motherboards.

All you need to build your own multimedia system is this kit, hard disk, monitor and operating system of choice. Simply pop in the hard drive, adapters and CD-ROM! Then power up and enjoy the enormous savings—up to $300!

Tiger Assemble-It-Yourself Multimedia Kits

Item #	Processor	MB	HD Support	Mouse	Price
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A13-KT 5	IBM 6x86MX PR233	ATX	Ultra	IntelliMouse	$729.99
A13-KT 6	AMD-K6 MMX 233MHz	ATX	Ultra	IntelliMouse	$749.99
A13-KT 7	Pentium MMX 233MHz	ATX	Ultra	IntelliMouse	$829.99
A13-KT 8	Pentium II MMX 266MHz	ATX	Ultra	IntelliMouse	$1149.99
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Add a Hard Drive. See below for specials.

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- 56K BOCA Faxmodem
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- S3 ViRGE 3D Video With 4MB
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- PS/2 or Microsoft IntelliMouse
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J34-1002	4.3 GB	Ultra DMA	11 msec	33 MB/S	5400 RPM	512KB	3.5"	3 years	$209.99

Western Digital Full Kit

ITEM #	CAPACITY	INTERFACE	SEEK TIME	PRICE
W10-1136	3.1 GB	EIDE Mode 4	<12 msec	$199.99*
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ITEM #	CAPACITY	INTERFACE	SEEK TIME	PRICE
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Abort, Retry, Fail?

The Corex CardScan 300 was doing fine until it got to the e-mail address. (Corex ad.)

Fisher-Price Ready for Kindergarten & Parenting Guide

- Expand on kindergarten with 30 age-appropriate kills and 20 fun-filled activities in reading, math, problem solving, manners, and more!
- Disk 2 provides advice and guidance for helping your child get the most from early school and use of the computer

Ages 4 -6 Win 3.X Win 95

Yikes! Is this educational software or DOOM Junior? (PC Connection catalog.)

Philips to close Jupiter offices

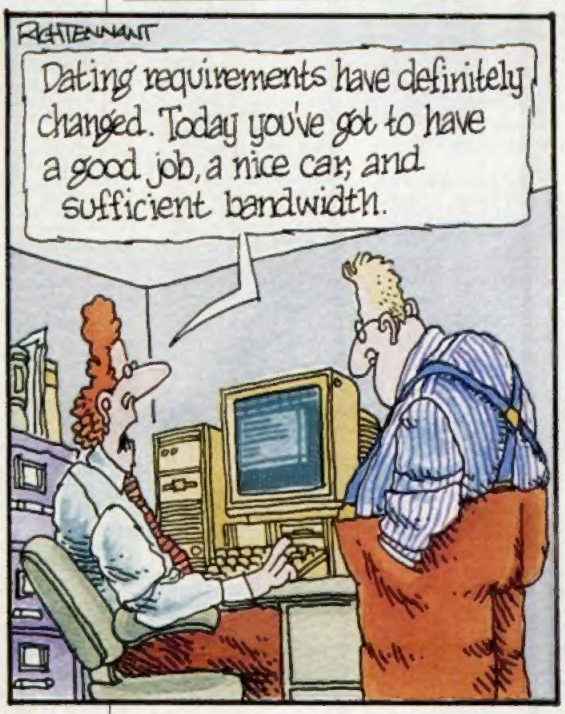
Yeah, the real growth market for consumer electronics is on Neptune. (*Electronic Buyers News.*)

Got Milk?

"If you are installing this driver into Windows 95, it is recommended that you EXIT this install program and install the mouse driver by using the 'Install New Hardware Wizard' icon lactated in the Control Panel."—MEMOREX PAD MOUSE DOCUMENTATION

Premillennial Tension

The Indiana commissioner of insurance sent agents a persnickety letter outlining details of how the state would be defining "year 2000–compliant" performance when it came to processing date-related data for insurance policies. Obviously the commissioner was taking all these chronological issues very seriously. Too bad the letter was dated September 12, 19997.



So once the flyboy lands on the roof, how exactly is he going to get downstairs? (Microsoft Flight Simulator ad.)

If your entry is used, we'll send you $50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, One Park Ave., New York, NY 10016-5802. Winners this issue: Paul Galloway, Edmund Hardy, Bobbie-Jo Lyons, Lisa Diana Shapiro, John Taylor, and Douglas Toombs.

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